prepmate

CSAT Preview

$$V = s^3$$

CSAT

Prelims GS Paper II

For Civil Services Preliminary Exam

TABLE OF CONTENTS

SECTION I: Reading Comprehension

SECTION II: Decision Making

SECTION III: General Mental Ability

SECTION IV: Data Sufficiency

SECTION V: Data Interpretation

SECTION VI: Reasoning

READING COMPREHENSION

INTRODUCTION TO READING COMPREHENSION (RC)

WHAT DOES READING COMPREHENSION INVOLVE?

Reading comprehension mainly involves two tasks.

1. Reading the passage.
2. Answering the questions, asked from the passage, on the basis of one's understanding of the passage.

To ensure a successful completion of both the tasks, following principles are listed.

Note: Just reading the principles given below would not help rather the principles have to be inculcated in practice while answering the questions.

PRINCIPLES TO READ WELL:

1. Understanding the passage is of primary importance. Therefore, one should not read through the passage in haste without understanding the passage. Instead, one should read at a normal speed. This principle is especially applicable in CSAT because the passage length usually varies from 100 - 350 words and the questions asked from the passage primarily test the candidate's understanding of the passage.

Reading at a speed that hampers the candidate's passage comprehension ability will only result in the loss of time of the candidate and the candidate will end up reading the passage again and wasting more time on the same.. Therefore, reading the passage at a normal speed actually saves a lot of time of a candidate.

2. It is worthwhile to read a part of the passage again if one is not able to understand that particular part of the passage. It is even worth to read the whole passage again if one is not able to follow the whole passage.

3. It is important to infer the topic of the passage. Generally, the topic of the passage can be inferred by reading the beginning of the passage. Therefore, it is important to focus on the beginning of the passage. If one is able to infer the topic of the passage, it is easier to understand the rest of the passage. Example: topic of Passage -1, CSAT 2011 paper set A, is "role of state" mentioned in the first line of the passage.

4. A candidate is not expected to remember the passage word by word. However, it is expected that the candidate remembers the gist of the passage.

5. It is also important to understand the role of each paragraph in the passage. For instance, a paragraph may contain explanation of a theory, criticism of an idea, comparison of two ideas, advantages of a strategy, etc.

6. After reading a certain part of the passage, it is important to recall the gist of the passage specially while reading lengthy passages. Otherwise, a candidate tends to forget the information which was read earlier in the passage.

7. Look for the opinion of the author in the passage. The opinion of the author is particularly important because many questions are based on the opinion of the author only.

8. Reading comprehension does not test the vocabulary of a candidate rather it tests the ability to comprehend the written text. Therefore, we do not recommend learning word lists and consider the same as a wastage of time.

9. If you find a passage very difficult, attempt the passage in the last. Don't solve the passage at the cost of leaving other questions unattempted.

10. Sometimes, the passage is very difficult to understand but the questions asked from the passage are very easy to answer. Therefore, if the candidate is not able to understand the passage, we recommend that the candidate should go through the questions and try to find the answers to the questions from the passage.

Note: Some books on Reading Comprehension suggest writing a passage map. However, we don't suggest this strategy and consider such a strategy counterproductive because writing while reading disturbs the flow of reading and hampers the understanding of the passage.

PRINCIPLES TO ANSWER THE QUESTIONS ACCURATELY:

Always answer the questions according to the information mentioned in the passage. Questions on passages asked in CSAT can be categorized. Categorization is required for two reasons: Firstly, categorization familiarizes the candidate with the type of questions asked in CSAT exam. Secondly, a candidate can adopt an appropriate strategy for each type of question. Therefore, ultimately categorization saves time and improves the accuracy of a candidate in answering the questions.

CATEGORISATION OF QUESTIONS ASKED UNDER RC

There are three main categories of questions asked under reading comprehension:

I. OVERALL IDEA CONVEYED BY THE AUTHOR:

Finding an answer to this type of question requires an overall understanding of the passage. The overall idea is covered in the whole passage (or in all the parts of the passage) and not in a particular part of the passage.

Wrong answer choices are those which are either discussed in only a part of the passage or are not discussed in the passage at all.

This question is asked in a variety of ways:
1. What is the essential message conveyed by the author of the passage?
2. Which of the following statements best describe the thought of the writer?
3. The passage thematically centres on:
4. What is the crux of the passage?
5. Which one of the following statements conveys the key message of the passage?
6. Which one of the following statements conveys the inference of the passage?
7. Which of the following would be an appropriate title for the passage? etc.

II. SPECIFIC DETAIL TYPE QUESTIONS:

Specific detail type questions are based on the information given in some part of the passage.

Finding an answer to these questions requires a candidate to refer to that part of the passage from where the question has been asked except if the candidate is sure about the correct answer.

Wrong answer choices are those which are either not mentioned in the passage or convey a different meaning than what is stated in the passage.

Specific detail type questions constitute a major chunk of reading comprehension questions. These questions can be further categorized as follows:

1. SIMPLE SPECIFIC DETAIL TYPE QUESTIONS:

These questions require a candidate to find a single piece of information in the passage and are the easiest of all the types of specific detail questions.

The question stem guides the search for the correct answer towards that part of the passage where related information is present in the passage. For instance, the question stem in the following example is ‘the strategy of inclusive growth can be effected by focusing on’.

Example of simple specific detail question:
(Q .2 Set A, CSAT 2011)

1. According to the passage, the strategy of inclusive growth can be effected by focusing on
(a) Meeting all the needs of every citizen in the country.
(b) Increasing the regulations over the manufacturing sector.
(c) Controlling the distribution of manufactured goods.
(d) Delivery of the basic services to the deprived sections of the society.

2. SCATTERED SPECIFIC DETAIL TYPE QUESTIONS:

These questions require a candidate to evaluate many details given in the question.

Wrong answer choices are those which are either not mentioned in the passage or mould the meaning of the information stated in the passage.

Example of scattered specific detail question:
(Q .1 Set A, CSAT 2011)

2. According to the passage :
1) The objective of inclusive growth was laid down by the founding fathers of the nation.
2) Need of the hour is to have an enabling government.
3) The government should engage in maximum interference in market processes.
4) There is a need to change the size of the government.
Which of the statements given above are correct?
(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 4 only
(d) 1, 2, 3 and 4

3. COMMON QUESTION STEM BASED SPECIFIC DETAIL TYPE QUESTIONS:

These questions require a candidate to evaluate various statements given under a common question stem.

In this type of questions, the question stem guides a candidate to that part of the passage where the candidate finds the information which can be compared with the statements given in the question in order to evaluate both the statements.

'Common question stem based specific detail questions' differ from 'scattered specific detail questions'. 'Scattered specific detail questions' do not involve common question stem and consequently the candidate is required to find the answer from various scattered parts of the passage. On the other hand, in 'common question stem based specific detail questions', the candidate is required to find the answer from a single part of the passage where the information related to the common question stem is mentioned.

Example of common question stem based specific detail question:
(Q .7 Set A, CSAT 2011)

3. What according to the passage are the manifestations of social movements?
1) Aggressiveness and being incendiary
2) Instigation by external forces
3) Quest for social equality and individual freedom
4) Urge for granting privileges and self respect to disparaged sections of the society.
Select the correct answer from the codes given below:
(a) 1 and 3 only
(b) 2 and 4 only
(c) 3 and 4 only
(d) 1, 2, 3 and 4

4. TWO STATEMENT SPECIFIC DETAIL TYPE QUESTIONS:

In these questions two statements require evaluation.

The statements, requiring evaluation, are very close to the information given in the passage and therefore, require a careful comparison.

As the statements are very close to the information stated in the passage, a candidate is essentially required to refer back to the passage and compare the statements with the information given in the passage.
Wrong statement is either not mentioned in the passage or is similar to the information given in the passage but different in meaning than what is stated in the passage.

Usually, the wrong statement is an extreme statement which conveys an extreme meaning as it involves use of words such as never, always etc. in place of may, sometimes etc.

Example of two statement specific detail question:
(Q .8 Set A, CSAT 2011)

4. With reference to the passage, consider the following statements:
1) To be a creative society, it is essential to have a variety of social movements.
2) To be a creative society, it is imperative to have potential contradictions and conflicts.
Select the correct answer from the codes given below:
(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

IV. MEANING OF A PARTICULAR DETAIL TYPE QUESTIONS:

These questions require a candidate to evaluate whether the statements mentioned in the question reflect the meaning of the information stated in the question stem or not.

To answer such questions, read the information (the meaning of which has been asked) in the passage and identify the meaning of the information. To identify the meaning of the information, read the text, given in the passage, in context of the information.

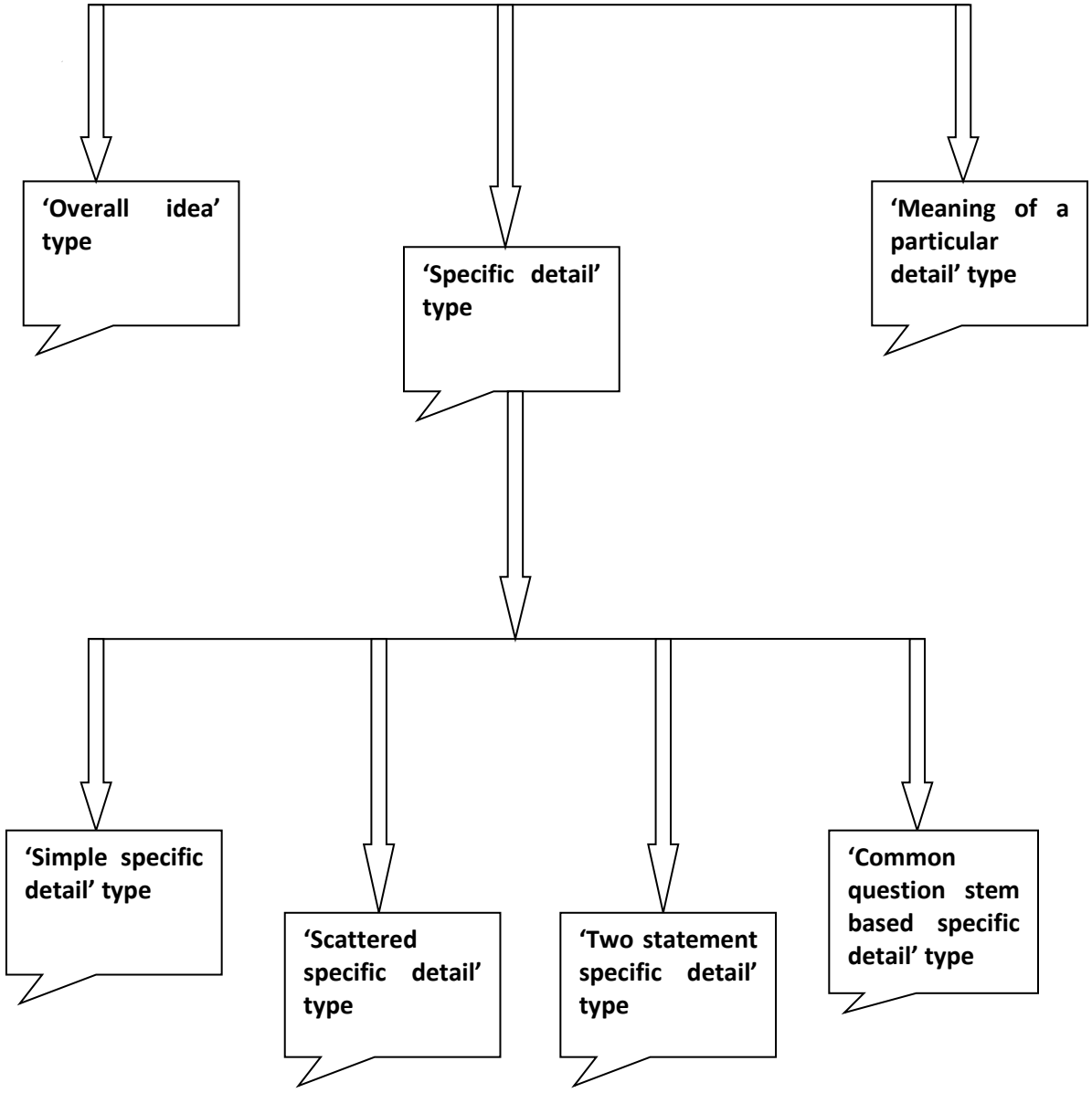
'Reading in context' requires reading of the complete idea which is related to the information. As a thumb rule, reading in context refers to the reading of the whole paragraph related to the information.

Example of meaning of particular detail question:
(Q .8 Set A, CSAT 2011)

5. The passage contains a statement "lets himself be swept along like a log of wood by a current." Among the following statements, which is/are nearest in meaning to this?
1) A person does not use his own reason.
2) He is susceptible to influence/pressure.
3) He cannot withstand difficulties/challenges.
4) He is like a log of wood.
Select the correct answer using the codes given below:
(a) 1 only
(b) 1 and 2
(c) 2 and 3
(d) 1 and 4

Note: The above mentioned question types cover all the questions which are asked under reading comprehension section of CSAT. Identify the above given question types in the following passages. Further, apply these tips while solving CSAT past year papers and realize yourself, how easy it becomes to score high in reading comprehension.

TYPES OF QUESTIONS ASKED IN READING COMPREHENSION



OTHER QUESTION TYPES WHICH MAY BE ASKED ARE:

1. Relation of one paragraph with another paragraph in the passage:
The answers to these types of questions require an understanding of the role of each paragraph in the passage.
Generally, in these types of questions, one paragraph outlines a general process about something, while the other gives details of the first paragraph or provides an example of the general outline mentioned in the first paragraph.

2. Purpose of the paragraph or detail in the passage:
The answers to these types of questions are based on understanding the role of each paragraph in the passage and the relevance of including a particular paragraph in the passage.

3. Tone of the passage:
The answers to these types of questions require a thorough understanding of the author's point of view. After understanding the author's point of view, the candidate can comment on the tone of the passage. The tone of the passage may be unpleasant, unbiased, pessimistic, optimistic, futuristic etc.

GOLDEN RULES OF READING COMPREHENSION:

1) The better you understand a passage, the higher you score. The faster you read, the least understanding you develop for the passage.

2) The approach to solve the questions should be based on the classification of the questions and the strategy given for answering each type of question.

TIPS FOR CORRECT EVALUATION OF SELF:

Often when one attempts reading comprehension, one matches the answers with the answer-key to find out whether one has answered the questions correctly or not but stops before trying to find a reason why one failed to answer correctly. So, it is important to evaluate oneself by asking:

1. Did I read the passage in the appropriate manner?
2. Was I able to understand the passage?
3. Have I applied the classification of questions?
4. Have I used the strategy to handle a particular type of question?

Note: Candidates fail in RC because they fail to follow the principles of reading well and of answering the questions. As Reading Comprehension is the most important section of CSAT in terms of marks (constituting almost half of the paper), inculcation of these principles in one's reading ensures success in CSAT exam.

Note: The passages included in this book are from a variety of disciplines such as sciences, physics, biology, etc. and social sciences such as psychology, sociology, philosophy, history, economics, etc. The nature, content and length of these passages and the questions covered under these passages are based on the pattern followed in CSAT past year papers.

Enjoy Reading…. Best of Luck!

General Mental Ability

8. TIME, SPEED AND DISTANCE

Speed is the rate at which the distance is covered and therefore the basic relation between Speed, Distance and Time is

$$\text{Speed} = \frac{\text{Distance Covered}}{\text{Time taken}}$$

$$\text{Or Time} = \frac{\text{Distance Covered}}{\text{Speed}}$$

Or Distance = Time × Speed

From the formula given above, it can be said that:
Speed is inversely proportional to time. For instance, let's suppose that a person covers a distance of 100 km. If the person covers the distance at the speed of 25 km/hr, then he requires 4 hours to cover the distance. Now, if the person covers the distance at the speed of 50 km/hr, then he requires 2 hours to cover the distance.

Therefore, if the speed of the person is doubled, then the time required to cover the distance is halved provided that the distance remains the same.

Also, speed is directly proportional to distance. For instance, if a person covers a distance of 100km at the speed of 25kmph in 4 hours, then he will cover distance of 200 km at the speed of 50kmph in the same time period.

Therefore, if the speed of the person is doubled, then the distance travelled is also doubled provided that the time taken to travel remains the same.

Similarly, Distance is directly proportional to time. Therefore, if the time taken to travel is reduced to half, then the distance covered will also be halved.

UNITS OF SPEED, DISTANCE AND TIME

The units of distance are metre, kilometre etc. The units of time are second, minute, hour etc.

Therefore, the units of speed are either metre/ second or km/hour.

$$1\text{km/hr} = \frac{1\text{km}}{1\text{hr}} = \frac{1000\text{m}}{3600\text{s}} = \frac{5}{18}\text{m/s}$$

Therefore, to convert speed given in km/hr to m/s multiply speed with $\frac{5}{18}$ and to convert speed given in m/s to km/hr multiply speed with $\frac{18}{5}$

Note: The standard units for speed are km/hr or m/s. In case the unit of speed is km/hr, then it means that the unit of distance is kilometre and the unit of time is hour. Similarly, in case m/s is the unit of speed, then it means that the unit of distance is metre and the unit of time is seconds.

Example 1:
A person covers a distance of 20 km in 5 hours. What is the speed of the person?
Sol.1 Distance covered or travelled = 20km
Time taken to cover the distance = 5 hours

$$\text{Thus, Speed} = \frac{\text{Distance Covered}}{\text{Time taken}} = \frac{20}{5} = 4 \text{ km/hr}$$

Example 2:
A person starts from his house at 9:00 a.m. and drives a car at the speed of 50 km/hr for a period of 17 hours to reach his uncle's house. Find the distance between his house and his uncle's house.

Sol.2 Distance travelled or distance covered between his house and his uncle's house = Speed × Time = 50 × 17 = 850 km.

Example 3:

If in the above example, the person is required to come back to his house in 8.5 hours, then find the speed at which the person is required to drive.

Sol.3 Speed $= \frac{\text{Distance Covered}}{\text{Time taken}} = \frac{850}{8.5} = 100$ km/hr

Example 4:

A boy runs a distance of 100 m at the speed of 18 km/hr. Find the time taken (in seconds) by the boy to cover the distance.

Sol.4 To calculate the time in seconds we need to have the unit of speed in m/s and unit of distance in metres.

Speed in m/s = $18 \times \frac{1000}{3600} = 5$ m/s

Time = $\frac{\text{Distance Covered}}{\text{Speed}} = \frac{100 \text{ m}}{5 \text{ m/s}} = 20$ seconds

Example 5:

A train travels at a speed of 60 km/hr between two stations A and B, 240 km apart, if it does not stop at any station between A and B. But, the train travels at an average speed of 40 km/hr if it stops at other stations in between the two stations. What is the average stoppage time per hour of the train?

Sol.5 Time taken by the train, when it does not stop = 240/60 = 4 hrs

Time taken by the train, when it stops = 240/40 = 6 hrs

Total stoppage time = 6 – 4 = 2 hrs

Average stoppage time per hour =

$= \frac{\text{Total stoppage time}}{\text{Total time taken by the train when it stops}}$

= 2/6 = 1/3 hrs = 20 min.

Example 6:

If a boy walks at $\frac{5}{6}$th of his usual rate, then he reaches his school 12 minutes late. Find the usual time taken by the boy to reach the school.

Sol.6 Distance covered at usual speed and at $\frac{5}{6}$th of the usual speed is the same.

Let 'T' be the usual time taken to cover the distance. Then, T + 12 min is the time required to reach school at $\frac{5}{6}$th of the usual speed.

Let 'S' be the usual speed.

As the distance covered is same in both the cases, therefore

$S \times T = \frac{5}{6} S \times (T + 12 \text{ min})$

T = 60 min or 1 hour

AVERAGE SPEED

The average speed is defined as the total distance travelled divided by the total time taken. Suppose a person travels the distance 'D' from starting point to destination at a speed of 30 km/hr and travels back from the destination to the starting point at a speed of 20 km/hr, then the average speed of the person is given by

$= \frac{\text{Total distance travelled}}{\text{Total time taken}}$

$= \frac{\text{Distance travelled to reach the destination + Distance travelled to come back to starting point}}{\text{Time taken to reach the destination + Time taken to reach the starting point}}$

$= \frac{D+D}{\frac{D}{30}+\frac{D}{20}} = \frac{2 \times 30 \times 20}{30+20} = 24$ Km/hr

Short-cut method to calculate the average speed:

If equal distance is travelled at a speed of u and v, then the average speed can be calculated as $\frac{2UV}{U+V}$, where U is the speed at

which the person travelled to the destination and V is the speed at which the person travelled back to the starting point.

In the above example, average speed = $\frac{2UV}{U+V}$

$= \frac{2 \times 30 \times 20}{30+20} = 24$ Km/hr

Note: The average speed is not the average of the given speeds (i.e. average of 20 and 30).

However, if a person travels half the time at a speed of 20 km/hr and remaining half at a speed of 30 km/hr, then the average speed of the person is

$= \frac{20 \times t + 30 \times t}{2t} = \frac{20+30}{2} = 25$Km/hr (i.e. the average of the speeds)

Example 7:

A doctor reaches hospital from her house at a speed of 60 km/hr whereas she comes back to her house from the hospital at a speed of 40km/hr. Find the average speed of the doctor for the whole journey?

Sol.7 Average speed of the doctor

$= \frac{\text{Total distance travelled}}{\text{Total time taken}}$

$= \frac{\text{Distance travelled to reach hospital} + \text{Distance while coming back}}{\text{Time taken to reach hospital} + \text{Time taken while coming back}}$

$= \frac{D+D}{\frac{D}{60}+\frac{D}{40}} = \frac{2 \times 60 \times 40}{60+40} = 48$ Km/hr

RELATIVE SPEED

Relative speed of the object refers to the speed of the object in relation to the speed of other object.

Suppose two cars A and B are moving with the same speed in the same direction on two parallel roads. To an observer sitting in car A, the car B appears to be stationary. This observation is expressed by saying that the relative speed of car A with respect to that of car B is zero.

On the other hand, if the two cars A and B are moving in opposite direction, then the relative speed of the car A with respect to that of car B is equal to the sum of the speeds of the car A and car B.

Consider two cars A and B separated by a distance of 1,000 km. Car A is driven at 60km/hr and car B is driven at 40 km/hr. If both the cars are driven towards each other, after what time will they meet?

In 1 hour, car A and car B will cover a distance of 60 km/hr and 40 km/hr respectively. Therefore, every hour the distance between the two cars will reduce by 100 km. Therefore, 100 km/hr is the relative speed of car A or car B with respect to the speed of the other car.

The entire distance between the two cars will be covered in 10 hours. In these 10 hours, car A will cover 600 km and car B will cover 400 km.

To conclude, if two objects are moving in the opposite directions (either towards each other or away from each other), with a speed of X and Y respectively, the relative speed of either of them with respect to that of the other is X+Y.

Now, let us assume that the two cars A and B are moving in the same direction. In how many hours will car A take a lead of 100 km over car B?

In one hour, car A will move 60 km but car B will move 40 km. Therefore, every hour car A will gain a distance of 20km over car B. Therefore, the relative speed of car A with respect to car B when both

the cars are moving in the same direction is 20km/hr.

Every hour, car A will travel 20 km more than car B and will take a lead of 100 km over car B in 5 hours. In 5 hours car A will travel a distance of 300km while car B will travel a distance of 200km.

To conclude, if two objects are moving in the same direction with a speed of X and Y respectively, the relative speed of one of them with respect to the other is X –Y (If X is faster) OR Y–X (If Y is faster).

Example 8:
The distance between two stations, X and Y, is 300 km. From station X train A leaves @ 30 km/hr for station Y. At the same time train B departs from station Y @ 45 km/hr for station X. Both the trains stop after meeting each other. The distance covered by train A is:
Sol.8 Relative speed of the two trains = 30+45 = 75 km/hr
Time taken by the trains to meet each other = $\frac{\text{Distance}}{\text{Speed}} = \frac{300}{75}$ = 4 hours
Distance travelled by train A in 4 hours = Time × Speed = 4 × 30 = 120 km

Example 9:
A thief spots a policeman 200 m away. If the policeman chases the thief immediately, then in how much time will the policeman catch the thief? The speeds of the thief and the policeman are 8 km/hr and 10 km/hr respectively.
Sol.9 Relative speed of the policeman = 10 – 8 = 2 km/hr
Relative speed of the policeman in m/s = $2 \times \frac{5}{18}$ m/sec = $\frac{5}{9}$ m/ sec
Time taken to cover 200 m = $\frac{200}{5/9}$ = 360 sec. = 6 min.

PROBLEMS ON TRAINS

Case I. <u>Time taken by a train to cross a stationary pole or a telegraph post</u>
Distance covered by a train to cross a pole is equal to the length of the train because the whole length of the train is required to pass the pole. Moreover, the width of the pole is insignificant and therefore, is not taken into consideration.
Time required by a train to cross a pole or a telegraph post = $\frac{\text{Length of the train}}{\text{Speed of the train}}$

Example 10:
A 100m long train travels at a speed of 60 km/hr. How much time will it take to cross an electricity pole?
Sol.10 1km/hr = $\frac{5}{18}$ m/s
Speed of the train = 60 km/hr = $60 \times \frac{5}{18}$ m/s
Distance travelled by the train to cross the electricity pole = Length of the train
Required time = $\frac{100}{60 \times \frac{5}{18}}$ = 6 seconds

Case II. <u>Time taken by a train to cross a platform</u>
Distance covered by a train to cross a platform is equal to the length of the train plus the length of the platform because the whole length of the train is required to pass the platform.
Time required by a train to cross a platform = $\frac{\text{Length of the train+Length of the platform}}{\text{Speed of the train}}$

Example 11:
A 100m long train travels at the speed of 60 km/hr. How much time will it take to cross a platform 250 m long?
Sol.11 Distance to be covered by the train
= length of the train+ Length of the platform
= 100+250 = 350m

Time required = $\frac{350}{60\times\frac{5}{18}} = 21$ seconds

Case III. <u>Time taken by a train to cross a man running in the same direction as that of the train</u>

Relative speed of a train with respect to a man = Speed of the train – Speed of the man

Distance = Length of the train as the whole train is required to pass from the side of the man (the width of the man is ignored because it is insignificant)

Time taken by a train to cross a man running in the same direction

$= \frac{\text{Length of the train}}{\text{Speed of the train} - \text{Speed of the man}}$

Example 12:

A 100m long train travels at the speed of 60 km/hr. How much time will it take to cross a man running at the speed of 6km/hr in the same direction?

Sol.12 Time taken by the train to cross the man running in the same direction = $\frac{\text{Distance}}{\text{Relative speed}} = \frac{\text{Length of the train}}{\text{Relative speed of the train}} = \frac{100}{(60-6)\times\frac{5}{18}} = \frac{100}{54\times\frac{5}{18}} = 6.67$ seconds

Case IV. <u>Time taken by a train to cross a man running in the opposite direction as that of the train (towards the train)</u>

Relative speed of a train with respect to the man = Speed of the train + Speed of the man

Note: When a train and a man are running in the opposite direction, then the relative speed of the train is the sum of speeds of the train and the man.

However, when the train and the man are running in the same direction, then the relative speed of the train is the difference between the speed of the train and the speed of the man.

Distance = Length of the train as the whole train is required to pass from the side of the man (the width of the man is ignored because it is insignificant)

Time taken by a train to cross a man running in the opposite direction = $\frac{\text{Length of the train}}{\text{Speed of the train} + \text{Speed of the man}}$

Example 13:

A 110m long train travels at the speed of 60 km/hr. How much time will it take to cross a man running at the speed of 6km/hr in the opposite direction?

Sol.13 Relative speed of the train = Speed of the train + Speed of the man = 60 + 6 = 66 km/hr

Distance to be covered = Length of the train = 110m

Required time= $\frac{110}{(60+6)\times\frac{5}{18}} = 6$ seconds

Example 14:

A train 50m long travelling @ 40 km/hr crosses a train 100m long (travelling in the opposite direction) in 6 seconds. The speed of the second train is:

Sol.14 Let the speed of the second train be $'x'$ m/s.

Total distance to be covered =Sum of the lengths of both the trains = 50 +100 = 150 m.

Relative speed of the trains = Sum of the speeds = (40 + x) km/hr

Required time = $\frac{\text{Distance covered}}{\text{Relative speed}} = \frac{150}{(40 + x)\times\frac{5}{18}}$

$6 = \frac{150}{(40 + x)\times\frac{5}{18}}$

x = 50 km/hr

PROBLEMS ON BOATS AND STREAMS

Let the speed of river be Y km/hr and the speed of a boat be X km/hr. A river flows in a particular direction. The boat is said to travel downstream if it is rowed in the

direction of the stream and the boat is said to travel upstream if it is rowed against the direction of the stream. Therefore, we have

Downstream speed (D) = Speed of a boat (X) + Speed of a river (Y)

Upstream Speed (U) = Speed of a boat (X) – Speed of a river (Y)

Further by adding and subtracting these equations we get,

Speed of boat (X) = $\frac{\text{Downstream speed (D)}+\text{Upstream speed (S)}}{2}$

Speed of stream (Y) = $\frac{\text{Downstream speed (D)}-\text{Upstream speed (S)}}{2}$

Example 15:

A boat is rowed 28km down the river in 4 hours and 12 km up the river in 6 hours. Find the speed of the boat and the river.

Sol.15 Downstream speed is $\frac{28}{4}$ = 7 km/hr

Upstream speed is $\frac{12}{6}$ = 2 km/hr.

Speed of the boat in still water= x km/hr

Speed of the river = y km/hr

Therefore, $x + y = 7$ and $x - y = 2$

x = 4.5 km/hr and y = 2.5 km/hr

Speed of the boat = 4.5 km/hr

Speed of the river = 2.5 km/hr

Example 16:

A man can swim with and against the stream at the speed of 3 km/hr and 2 km/hr respectively. How much time will he take to swim 7.5 km in still water?

Sol.16 Let man's speed be x km/hr. let stream's speed be y km/hr

Therefore, $x + y = 3$ and $x - y = 2$

x = 2.5 km/hr

Time required to swim 7.5 km = $\frac{\text{Distance}}{\text{Speed}}$ = $\frac{7.5}{2.5}$ = 3 hours

CIRCULAR MOTION

Let A and B participate in a race and start from the same point on a circular track of length (circumference) 1000 m. A runs at the speed of 5m/s whereas B runs at the speed of 3 m/s. If A and B start simultaneously, then after how much time will they meet for the first time?

As it is a race, A and B will be running in the same direction. Every time the faster one (A) covers one round more than the slower one (B), both A and B meet each other at the same point on the circular track. Therefore, A is required to cover the additional distance equal to the circumference of the circle to meet B.

Now, both A and B are running. Therefore, the relative speed of A in comparison to that of B is the difference between speed of A and speed of B (5 – 3 = 2 km/hr).

Therefore, time taken by A to gain one complete round over B = $\frac{\text{Circumference of the track}}{\text{Relative speed of A}}$ = $\frac{1000}{2}$ = 500 seconds

Let us understand this situation from another view point. We know that A runs at the speed of 5m/s and B runs at the speed of 3m/s. Therefore, the ratio of their speeds is 5: 3 and consequently the ratio of their distance covered is 5: 3. Therefore, when A covers 5 rounds, B covers 3 rounds.

We can also say that when A covers 2.5 rounds, B covers 1.5 rounds (2.5 : 1.5 = 5 : 3). Therefore, when B covers 1.5 rounds, A gains one complete round over B.

Time taken by B to complete 1.5 rounds = $\frac{\text{Distance}}{\text{Speed}}$ = $\frac{1.5 \times 1000}{3}$ = 500 seconds

A will take the same time to complete 2.5 rounds.
Time taken by A to complete 2.5 rounds = $\frac{\text{Distance}}{\text{Speed}} = \frac{2.5 \times 1000}{5} = 500$ seconds

Now, let us see when will A and B be together at the starting point for the first time?

A covers a complete round to reach the starting point. Therefore, A reaches the starting point after every $\frac{1000}{5} = 200$ seconds

Similarly, B covers a complete round to reach the starting point. Therefore, B reaches the starting point after every $\frac{1000}{3}$ seconds

A and B will be together at the starting point for the first time after the time equal to the LCM of the time taken by A and B to complete one round i.e. LCM of 200 and $\frac{1000}{3}$ which is 1000 seconds.

Now, let us suppose that A and B are running in the opposite direction.
A and B will be together when they will cover the entire circular track.
In this case the relative speed is the sum of the speeds of A and B as they are running in opposite direction.

Therefore, time required to complete one round when both A and B are running in the opposite direction = $\frac{\text{Length of the circular track}}{\text{Relative speed}} = \frac{1000}{5+3} = \frac{1000}{8} = 125$ seconds

Example 17:
A can run one round of a circular track in 6 minutes and B can run one round of the circular track in 9 minutes. Both A and B start simultaneously from the same starting point, find

I. When will A and B meet at the starting point for the first time?
Sol. Time taken by A and B to meet at the starting point for the first time is the time equal to the LCM of 6 minutes and 9 minutes, i.e. 18 minutes.

II. When will A and B meet for the first time anywhere on the track?
Sol. Let the length of the track =L
Thus, the speed of A = $\frac{L}{6}$ and the speed of B = $\frac{L}{9}$
Time taken by A and B to meet for the first time anywhere on the track = One round gained by A over B = $\frac{\text{Distance}}{\text{Relative speed}} = \frac{\text{Length of the track}}{\text{A's speed} - \text{B's speed}} = \frac{L}{\frac{L}{6} - \frac{L}{9}} = 18$ min

III. Now, let us assume that A and B are running in the opposite direction, when will they meet for the first time?
Sol. Let the length of the track = L
Therefore, the speed of A = $\frac{L}{6}$ and the speed of B = $\frac{L}{9}$
Relative speed when A and B are moving in the opposite direction = Speed of A + Speed of B
Time taken by A and B to meet = $\frac{\text{Distance}}{\text{Relative speed}} = \frac{\text{Length of the track}}{\text{A's speed} + \text{B's speed}} = \frac{L}{\frac{L}{6} + \frac{L}{9}} = \frac{18}{5} =$ 3.6 min

Example 18:
Two cyclists A and B ride on a circular track of length 60 km. A's speed is 10 km/hr and B's speed is 15 km/hr. When will A and B be together at the starting point?
Sol.18 Time taken to complete one round = $\frac{\text{Length of the track}}{\text{Speed}}$

Time taken by A to complete one round = $\frac{60}{10}$ = 6 hours
Time taken by B to complete one round = $\frac{60}{15}$ = 4 hours
Time taken by A and B to be together at the starting point = L.C.M. of 4 and 6 = 12 hours

Let us now attempt to solve the practice exercise to master the concept of speed, distance and time.

PRACTICE EXERCISE

1. When a car is driven without any stop, then it covers a distance at the speed of 54 km/hr. However, when it is driven with the stops, then it covers the distance at the speed of 45 km/hr. The number of minutes per hour for which the car stops is
(a) 9 min
(b) 10 min
(c) 12 min
(d) 15 min

2. When A walks to school at a speed of 10 km/hr, he reaches 6 min late. When he walks at a speed of 12 km/hr, he reaches 9 min earlier than the scheduled time. What is the distance of the school from his house?
(a) 10 km
(b) 15 km
(c) 20 km
(d) 30 km

3. Two trains A and B travel towards each other at a speed of 36 km/hr and 40 km/hr respectively. When the trains meet, it is found that one train has covered 32 km more than the other train. What was the distance between the two trains at the start of the journey?
(a) 304 km
(b) 636 km
(c) 544 km
(d) 608 km

4. A thief ran at a speed of 4.5 km/hr from a prison at 1:00 a.m. The thief was chased by a policeman. The policeman ran at a speed of 6 km/hr from the prison at 3:00 a.m. At what time will the policeman catch the thief?
(a) 3 a.m.
(b) 5 a.m.
(c) 7a.m.
(d) 9a.m.

5. A travels a distance of 600 km partly by train and partly by car to reach home. He takes 14 hours if he travels 120 km by train and the rest by car. But he takes 30 min less if he travels 180 km by the train and the rest by car. Find the speeds of the train and the car.
(a) 40 km/hr, 60 km/hr
(b) 60 km/hr, 40 km/hr
(c) 80 km/hr, 40 km/hr
(d) None of the above

6. A train travelling at a constant speed crossed a 96 m long platform in 12 sec and a 141 m long platform in 15 sec. Find the length of the train.
(a) 15 m
(b) 42 m
(c) 84 m
(d) 225 m

7. A man rows 18 km downstream in 4 hours and returns back to his starting point in 12 hours. Find the speed of the boat in still water.
(a) 1.5 km/hr
(b) 2.25 km/hr
(c) 3 km/hr
(d) 4.5 km/hr

8. A woman rows 20 km upstream and comes back to the starting point in 3 hours. If the speed of the stream is 5 km/hr, then find the speed of rowing in still water.
(a) 10 km/hr
(b) 12.5 km/hr
(c) 15 km/hr
(d) 17.5 km/hr

9. An athlete runs 20 km against the wind and 24 km with the wind in 8 hours. She

also runs 30 km against the wind and 28 km with the wind in 11 hours. Find the speed of the athlete in the absence of the wind and the speed of the wind.
(a) 5 km/hr, 3 km/hr
(b) 6 km/hr, 2 km/hr
(c) 8 km/hr, 4 km/hr
(d) 12 km/hr, 4 km/hr

10. If a person runs along the sides of an equilateral triangle shaped field at speeds of X, Y and Z km/hr respectively and reaches back to the starting point, then find the average speed of the person.
(a) $\frac{3XYZ}{XY+YZ+ZX}$
(b) $\frac{X+Y+Z}{3}$
(c) $\frac{XYZ}{XY+YZ+ZX}$
(d) $\frac{3}{XY+YZ+ZX}$

11. A, B and C start at the same time in the same direction from the same point to run around a circular stadium. They complete a circular round in 36 seconds, 54 seconds and 60 seconds respectively. After what time will they meet again at the starting point?
(a) 1 min
(b) 5 min
(c) 9 min
(d) 10 min

12. A and B walk around a circular path of circumference 1000 metres. A walks @150 m/min and B@100 m/min. When will they be together again at the starting point, if they start from the same point and walk in the same direction?
(a) 10 min
(b) 15 min
(c) 17.5 min
(d) 20 min

13. Assuming the data given in the previous example, when will they be together anywhere else on the circular path?
(a) 10 min
(b) 15 min
(c) 17.5 min
(d) 20 min

14. Assuming the data given in previous question, when will they be together if they walk in the opposite directions?
(a) 4 min
(b) 8 min
(c) 10 min
(d) 20 min

15. Assuming the data given in previous question, C also decides to run with A and B on the circular track. C runs at the speed of 125 m/min in the same direction as that of A and B. When will they be together at the starting point?
(a) 20 min
(b) 30 min
(c) 40 min
(d) 50 min

16. Assuming the data from the previous question, when will A, B and C meet at any other point on the track?
(a) 15 min
(b) 20 min
(c) 30 min
(d) 40 min

Answer Key: TIME, SPEED and DISTANCE

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

Solutions: TIME, SPEED and DISTANCE

Sol. 1(b) 10 min
Explanation:
Number of minutes per hour for which the car stops = Time taken by the car to cover 9 km (54−45)
Time taken by the car to cover 54 km without a break = 60 min
Time taken by the car to cover 1 km = $\frac{60}{54}$ min
Time taken by the car to cover 9 km = $\frac{60}{54}$ × 9 = 10 min
Thus, The number of minutes per hour for which the car stops = 10 min

Sol. 2(b) 15 km
Explanation:
Let 'T' be the usual time taken by A to reach school.
Distance covered in both the cases i.e. at the speed of 10 km/hr and 12 km/hr is same.
Distance = Speed × Time
Thus, $10(T + \frac{6}{60}) = 12(T - \frac{9}{60})$
T = 1.4 hours
Time taken to reach the school at the speed of 10 km/hr = $T + \frac{6}{60} = \frac{14}{10} + \frac{6}{60} = \frac{90}{60}$ = 1.5 hours
Distance to the school = 10 × 1.5 = 15 km

Sol. 3(d) 608 km
Explanation:
Both the trains travel towards each other for the same time period. Let the time period for which the trains travel is 'T.'
Distance covered by train A – Distance covered by train B = 32 km
⇒40 × T – 36 × T = 32
Thus, T = 8 hours
Total distance between the trains = Speed × Time = (36 + 40) × 8 = 608 km

Sol. 4 (d) 9 a.m.
Explanation:
Distance travelled by the thief in 2 hours = 9 km
Relative speed of the policeman = Speed of the policeman – Speed of the thief = 1.5 km/hr
Time taken by the policeman to catch the thief = $\frac{\text{Distance}}{\text{Relative speed}} = \frac{9}{1.5}$ = 6 hours.
Therefore, the policeman will catch the thief at 3 + 6 = 9:00 a.m.

Sol. 5(b) 60 km/hr, 40 km/hr
Explanation:
Let the speed of the train and the car be x and y km/hr respectively.
Time = $\frac{\text{Distance}}{\text{Speed}}$
$14 = \frac{120}{x} + \frac{480}{y}$ - ①
$13.5 = \frac{180}{x} + \frac{420}{y}$ - ②
There are two methods to solve the equations.

Method I:
Put values from the answer choices and obtain the answer.
Therefore, Speed of train = 60 km/hr and the speed of car = 40 km/hr

Method II:
Such equations can also be solved by putting $\frac{1}{x}$ = u and $\frac{1}{y}$ = v
Thus, the equations become
14 = 120u + 480v
13.5 = 180u + 420v
Solve to get:
u = $\frac{1}{60}$ km/hr. Thus, x = 60 km/hr
v = $\frac{1}{40}$ km/hr. Thus, y = 40 km/hr

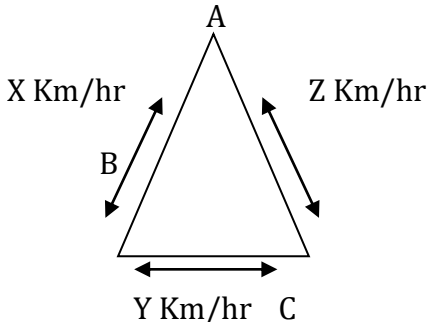
Sol. 6(c) 84 m
Explanation:
Let the length of the train = x metres
Let the speed of the train in m/s = y
Time = $\frac{\text{Distance}}{\text{Relative speed}}$
Thus, 12 = $\frac{x+96}{y}$ and 15 = $\frac{x+141}{y}$
x = 84 m, y = 15 m/s
Therefore, the length of the train is 84 m.

Sol. 7(c) 3 km/hr
Explanation:
Let the speed of the boat be x km/hr and the speed of the stream be y km/hr.
Speed of the boat downstream ($x + y$) = $\frac{\text{Distance}}{\text{Time}} = \frac{18}{4}$ = 4.5 km/hr
Speed of the boat upstream ($x - y$) = $\frac{\text{Distance}}{\text{Time}} = \frac{18}{12}$ = 1.5 km/hr
x = 3 km/hr
Thus, speed of the boat in still water = 3 km/hr

Sol. 8(c) 15 km/hr
Explanation:
Let x be the speed of rowing in still water.
Speed of stream = 5 km/hr
Total time taken rowing upstream and downstream = *3* hours
Total time taken = Time taken to travel upstream+ Time taken to travel downstream
3 = $\frac{20}{x+5} + \frac{20}{x-5}$
$3(x + 5)(x - 5) = 20(x - 5) + 20(x + 5)$
$3x^2 - 40x - 75 = 0$
$3x^2 - 45x + 5x - 75 = 0$
$(x - 15)(3x + 5) = 0$
$x = 15, \frac{-5}{3}$
Reject the negative value.
Thus, the speed of rowing in still water = 15 km/hr

Sol. 9(b) 6 km/hr, 2 km/hr
Explanation:
Let the speed of the athlete when he runs in the direction of the wind be x km/hr and let the speed of the athlete when he runs against the wind be y km/hr.
Then, $\frac{24}{x} + \frac{20}{y} = 8$
$\frac{28}{x} + \frac{30}{y} = 11$
Let $\frac{1}{x}$ be u and $\frac{1}{y}$ be v.
On solving both equations we get u = $\frac{1}{8}$ km/hr, v = $\frac{1}{4}$ km/hr
x = 8 km/hr and y = 4 km/hr
Therefore, Speed of the athlete in the absence of the wind = $\frac{1}{2}(x + y)$ = 6 km/hr
Speed of the wind = $\frac{1}{2}(x - y)$ = 2 km/hr

Sol. 10(a) $\frac{3XYZ}{XY+YZ+ZX}$
Explanation:



Let each side of the equilateral triangle be D.
A to B= X km/hr
B to C = Y km/hr
C to A = Z km/hr
T_{AB} = D/X. (T_{AB} = Time taken to cover the distance between A and B)
T_{BC} = D/Y
T_{CA} = D/Z
Total time = $T_{AB}+T_{BC}+T_{CA}$
$\Rightarrow \frac{D}{X} + \frac{D}{Y} + \frac{D}{Z} = D\left(\frac{YZ+XZ+XY}{XYZ}\right)$
Total distance travelled = D+D+D = 3D
Average speed = $\frac{\text{Total distance travelled}}{\text{Total time taken}} = \frac{3D}{D\left(\frac{YZ+XZ+XY}{XYZ}\right)} = \frac{3XYZ}{XY+YZ+ZX}$ km/hr
Sol. 11(c) 9 min

Explanation:
L.C.M. of 36, 54 and 60 = 540 seconds = 9 minutes
Thus, A, B and C will again meet at the starting point in 9 min.

Sol. 12(d) 20 min
Explanation:
Time taken by A to complete 1 round = $\frac{1000}{150} = \frac{20}{3}$ min
Time taken by B to complete 1 round = $\frac{1000}{100}$ = 10 min
Time taken by A and B to meet again at the starting point = LCM of time taken by A and B to complete 1 round
LCM of $\frac{20}{3}$ and 10 = $\frac{\text{LCM of numerator}}{\text{HCF of denominator}} = \frac{20}{1}$ = 20 min

Sol. 13(d) 20 min
Explanation:
In 1 minute, A gains 50 m over B as the speed of A is 150 m/min and the speed of B is 100 m/min.
Thus, relative speed of A with respect to B = 50 m/min
Time taken by A to gain one complete round (1000 m) over B = $\frac{1000}{50}$ = 20 min.
Therefore, time taken by A and B to be together again is 20 min.

Sol. 14(a) 4 min
Explanation:
Relative speed = 150+100 = 250 m/min
Time taken by A and B to be together = $\frac{1000}{250}$ = 4 min.

Sol. 15(c) 40 min
Explanation:
Time taken by A to complete one round = $\frac{20}{3}$ min.
Time taken by B to complete one round = 10 min.
Time taken by C to complete one round = $\frac{1000}{125}$ = 8 min.
Time after which all the three persons will again meet at the starting point= the LCM of $\frac{20}{3}$, 10 and 8 = 40 min.

Sol. 16(d) 40 min
Explanation:
A gains 50 metres per minute over B.
Thus, they will meet after every 1000/50 = 20 minutes.
A gains 25 metres per minute over C.
Thus, they will meet after every 1000/25 = 40 minutes.
All the three people will meet after the time which is equal to the LCM of 20 and 40 i.e. after 40 minutes.
A, B and C meet at the starting point after every 40 min.

DATA SUFFICIENCY

DATA SUFFICIENCY- I

Directions for data sufficiency questions: Read the following instructions carefully and mark the answers based on the given instructions.

Select choice (a) as an answer if the question can be answered by using only one of the statements alone.

Select choice (b) as an answer if the question can be answered by both the statements individually.

Select choice (c) as an answer if the question can be answered by using both the statements together, but cannot be answered using either statement alone.

Select choice (d) as an answer if the question cannot be answered even by using both the statements together.

1. What is the ratio of the two numbers?
I. The sum of two numbers is twice their difference.
II. The smaller number is 2.

2. What is the two-digit number whose first digit is 'a' and the second digit is 'b'?
I. The number is a multiple of 51.
II. The sum of the digits a and b is 6.

3. What is the two-digit number?
I. The sum of the digits is equal to the difference between the two digits.
II. The difference between the two digits is 9.

4. What is the two- digit number?
I. The difference between the number and the number obtained by interchanging the positions of the digits is 36.
II. The sum of the digits of that number is 12.

5. What is the present age of C?
I. Three years ago, the average age of A and B was 18 years.
II. The present average age of A, B and C is 21 years.

6. The sum of the ages of P, Q and R is 96 years. What is the age of Q?
I. P is 6 years older than R.
II. The sum of the ages of Q and R is 56 years.

7. A is twice as old as B. What is the difference in their ages?
I. Five years ago, the ratio of their ages was 3 : 1.
II. Ten years ahead, the ratio of their ages will be 3 : 2.

8. How old will C be after 10 years?
I. Five years ago, the average age of A and B was 15 years.
II. Average age of A, B and C today is 20 years.

9. How many children are there in the group?
I. Average age of the children in this group is 15 years. The sum of the ages of all the children in this group is 225 years.
II. The sum of the ages of all the children in the group and the teacher is 250 years. The age of the teacher is 10

years more than the average age of the children.

10. What is the average age of children in the class?
I. Age of the teacher is as many years as the number of children.
II. Average age increases by 1 year if the teacher's age is also included.

11. What is the cost price of the article?
I. The profit earned on the article is one-third of the cost price.
II. The article is sold for Rs. 400.

12. A man mixes two types of coffee (X and Y) and sells the mixture at the rate of Rs. 17 per kg. Find the profit made by the man.
I. The rate of X is Rs. 20 per kg.
II. The rate of Y is Rs. 13 per kg.

13. What is the price of a pen?
I. A man can buy 14 pens and 35 pencils for Rs. 84.
II. At 50% discount on the price of pens, the man can buy 4 pens and 5 pencils for Rs. 12.

14. What is the rate of simple interest?
I. The total interest earned was Rs. 4000.
II. The sum was invested for 4 years.

15. Find the principal which earned interest?
I. The total simple interest was Rs. 4000 after 4 years.
II. The total of principal and the simple interest was double of the principal after 5 years.

16. A man borrowed a total sum of Rs. 25000 from two moneylenders. To one he paid an interest @ 10% p.a. and to the other he paid @ 20% p.a. How much money did he borrow at each rate of interest?
I. The sum of the interests after one year was Rs. 4000.
II. The interest paid to the first moneylender was thrice the interest paid to the second.

17. What is the rate of compound interest?
I. The principal was invested for 3 years.
II. The earned interest was Rs. 1331.

18. How long will Machine A take to produce x candles (working alone)?
I. Machine B produces x candles in 6 minutes.
II. Machine A and Machine B working together produce x candles in 2 minutes.

19. B alone can complete a work in 20 days. How many days will A, B and C together take to complete the work?
I. A and B together can complete the work in 5 days.
II. B and C together can complete the work in 10 days.

20. In how many days can the work be done by 12 men and 6 women?
I. 2 men and 4 women can complete the work in 6 days.
II. 3 men and 6 women can complete the work in 4 days.

21. How long will it take to empty the tank if both the inlet pipe A and the outlet pipe B are opened simultaneously?
I. A can fill the tank in 14 minutes.
II. B can empty the full tank in 7 minutes.

22. Two pipes are opened simultaneously. What part of the tank will be filled by both the pipes A and B in 17 hours?
I. In 51 hours both the pipes fill one-third of the tank.

II. Pipe A fills the tank in half the time taken by pipe B to fill the tank.

23. A car and a bus start from city A at the same time. How far is the city B from city A?

I. The car travelling at an average speed of 60km/hr reaches the city B at 4:30 p.m.
II. The bus travelling at an average speed of 40km/hr reaches the city B at 6:00 p.m.

24. How much time did X take to reach the destination?

I. The ratio between the speeds of X and Y is 3 : 4.
II. Y takes 72 minutes to reach the same destination.

25. What is the usual speed of a train?

I. The speed of the train is increased by 10km/hr to reach the destination at 120 km away.
II. The train is late by 1 hour if it travels at its normal speed.

26. Two towns are connected by bus. Can you find the distance between them?

I. The speed of a deluxe bus is 12 km/hr more than that of an ordinary bus.
II. A deluxe bus takes 30 minutes less than an ordinary bus to cover the distance.

27. What is the average speed of the vehicle over the entire distance?

I. The vehicle covers the whole distance in three equal stretches at speeds of 10 km/hr, 20 km/hr and 30km/hr respectively.
II. The total time taken is 30 minutes.

28. What is the speed of the boat in still water?

I. The boat covers a distance of 24 km in 6 hours while running upstream.
II. The boat covers the same distance in 4 hours while running downstream.

29. A boat takes a total time of three hours to travel downstream from A to B and upstream back from B to A. What is the speed of the boat in still water?

I. The speed of the river current is 1 km per hour.
II. The distance between A and B is 4 km.

30. What is the speed of the boat in still water?

I. It takes 4 hours to cover the distance between A and B downstream.
II. It takes 6 hours to cover the distance between B and A upstream.

ANSWER KEY: DATA SUFFICIENCY- I

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

SOLUTIONS: DATA SUFFICIENCY- I

Sol. 1(a) Only statement I is sufficient to answer the question.
Explanation:
Let the two numbers be x and y
Statement I denotes $x + y = 2(x - y) \Rightarrow x = 3y \Rightarrow \frac{x}{y} = \frac{3}{1} \Rightarrow x : y = 3 : 1$
Therefore, Statement I alone gives the answer.
Statement II does not provide us with the answer.
Therefore, correct answer is (a).

Sol. 2(a) Only statement I is sufficient to answer the question.
Explanation:
I. Only one multiple of 51(i.e. 51 itself) is a two - digit number.
Therefore, statement I is sufficient.
II. a + b = 6
Statement II is insufficient.
Therefore, correct answer is (a).

Sol. 3(a) Only statement II is sufficient to answer the question.
Explanation:
Let the digits at the tens and the units place be x and y respectively. Then,
I. $x + y = x - y$
$y = -y$
$y = 0$
But value of x is not known. Thus, statement I is insufficient.
II. The difference between the digits is 9. Thus, one digit can only be 9 and the other 0. Further, only ten's digit can be 9.
Therefore, the number is 90.
Thus, only statement II is sufficient to answer the question and hence the correct answer is (a).

Sol. 4(c) Both the statements are required to find the solution.
Explanation:
Let the ten's digit be x and unit's digit be y. Thus, the number is $10x + y$
I. $(10x + y) - (10y + x) = 36$
$\leftrightarrow x - y = 4$
Statement I alone is insufficient.
II. $x + y = 12$
Statement II alone is insufficient.
Both statements I and II are together necessary to answer the question as 2 equations are required to find the value of two variables x and y.
Therefore, correct answer is (c).

Sol. 5(c) Both the statements are required to find the solution.
Explanation:
I. $\frac{1}{2}(A - 3 + B - 3) = 18$
$A + B = 42$
Thus, statement I is insufficient.
II. $\frac{1}{3}(A + B + C) = 21$
$A + B + C = 63$
Thus, statement II is insufficient.
From I and II, we get $C = (63 - 42) = 21$
Thus, both the statements I and II are required to find the answer.

Sol. 6(c) Both the statements I and II are required to give the answer.
Explanation:
Given: P + Q + R = 96
I. P = R + 6
Thus, R + 6 + Q + R = 96 or 2R + Q = 90
Statement I alone is insufficient.
II. Q + R = 56
Statement II alone is insufficient.
From I and II, we get R = 34
Putting R = 34 in Q + R = 56, we get Q = 22

Thus, both the statements I and II are required to give the answer.

Sol. 7(b) Both the statements I and II are individually sufficient to provide the answer.
Explanation:
Let A's present age be A years and B's present age be B years
Given that A = 2×B
I. $\frac{A-5}{B-5} = \frac{3}{1}$
Putting A = 2B, we get A = 20 and B= 10.
II. $\frac{A+10}{B+10} = \frac{3}{2}$
Putting A = 2B, we get A= 20 and B = 10.
Thus, both the statements I and II are individually sufficient to provide the answer. Therefore, the answer is (b).

Sol. 8(c) Both the statements I and II are required to provide the answer.
Explanation:
I. A – 5 + B – 5 = 15×2
A+B = 40
II. A+B+C = (20×3)
A+B+C = 60
From I and II, we get C = 20
C's age after 10 years = (20+10) years = 30 years
Therefore, correct answer is (c).

Sol. 9(a) Only statement I is sufficient to answer the question.
Explanation:
Let there be n children in the group.
I. Average age = 15 years
15 × n = 225
n = 15
Thus, statement I is sufficient to answer the question.
II. Total age of n children and 1 teacher is 250 years.
Let x be the average age of children
Age of teacher = $(x + 10)$ years
$x \times n + x + 10 = 250$
$(n + 1) \times x = 240$
Average age of the children cannot be calculated. Thus, statement II is insufficient to provide the answer.
Therefore, correct answer is (a).

Sol. 10(d) Both the statements I and II are not sufficient to answer the question.
Explanation:
Let there be n children and let the average age of the children be x years
I. Age of the teacher = n years
II. Average age of (n+1) persons(teacher + children) = (x+1) years
From both the statements I and II, the average age of children cannot be determined.
Therefore, correct answer is (d).

Sol. 11(c) Both the statements are required to answer the question.
Explanation:
I. Profit = $\frac{1}{3}$ C.P.
Statement I is insufficient.
II. S.P. = Rs. 400
Statement II is insufficient.
From I and II,
C.P. + Profit = S.P.
C.P. + $\frac{1}{3}$C.P. = 400
C.P. = Rs. 300
Both the statements together are sufficient. Thus, answer is (c).

Sol. 12(d) Both the statements together are not sufficient to give the answer.
Explanation:
The ratio in which X and Y are mixed is not given.
So, both I and II together cannot give the answer.
Therefore, correct answer is (d).

Sol. 13(d) Both the statements together are insufficient to provide the answer.
Explanation:

Let the price of a pen be Rs. x and that of a pencil be Rs. y.
I. $14x + 35y = 84$
Dividing the whole equation by 7, we get:
$2x + 5y = 12$
II. $4 \times \frac{x}{2} + 5y = 12$
$2x + 5y = 12$
Both the statements I and II result in the same equation and are insufficient to calculate the answer.
Therefore, correct answer is (d).

Sol. 14(d) Both the statements together are insufficient to provide the answer.
Explanation:
We know that, r = $\left(\frac{100 \times S.I}{P \times T}\right)$
I. S.I. = Rs. 4000
II. T = 4years
But, P is unknown. So, we cannot find r.
Thus, both the statements together are insufficient to find the value of r.
Therefore, correct answer is (d).

Sol. 15(c) Both the statements I and II are required to obtain the answer.
Explanation:
Let the principal be Rs. x
I. S.I. = Rs. 4000 and T = 4 years
Thus, statement I alone is insufficient.
II. Principal + S.I. for 5 years = 2 × Principal
Principal = S.I. for 5 years
Thus, statement II alone is insufficient.
From I and II,
S.I. for 4 years = Rs. 4000
Therefore, S.I. for 1 year = Rs. $\frac{4000}{4}$ = Rs. 1000
S.I. for 5 years = Rs. (1000×5) = Rs. 5000
Thus, both I and II are necessary to calculate the answer.
Therefore, correct answer is (c).

Sol. 16(b) Each statement alone is sufficient to answer the question.
Explanation:
Let the man borrowed Rs. x at 10 % p.a. and Rs. $(25000 - x)$ at 20% p.a.
I. Total interest = Rs. 4000
$x \times 1 \times \frac{10}{100} + (25000 - x) \times 1 \times \frac{20}{100} = 4000$
Thus, value of x can be found.
Therefore, statement I alone is sufficient.
II. $(25000 - x) \times \frac{20}{100} \times 1 = \left(3 \times x \times \frac{10}{100}\right)$
Thus, value of x can be found.
Therefore, statement II alone is sufficient.
Thus, data in statement I alone and also in statement II alone is sufficient to answer the question.
Therefore, correct answer is (b).

Sol. 17(d) Both the statements together are insufficient to obtain the answer.
Explanation:
Let Principal = Rs. P and Rate = R% p.a.
C.I. = $P[(1 + \frac{R}{100})^4 - 1]$ = Rs. 1331
As values of 'P' and 'R' are not known, both the statements together are insufficient to obtain the answer.
Therefore, correct answer is (d)

Sol. 18(c) Both the statements are required to get the answer.
Explanation:
I. Machine B produces $\frac{x}{6}$ candles in 1 min
II. Machine A and B produce $\frac{x}{2}$ candles in 1 min
From I and II, A produces $\left(\frac{x}{2} - \frac{x}{6}\right) = \frac{x}{3}$ candles in 1 min
Candles produced by A in 1 min are $\frac{x}{3}$
Therefore, x candles will be produced by A in $\left(\frac{3}{x} \times x\right)$ min = 3 min.
Thus, I and II both are necessary to get the answer.
Therefore, correct answer is (c).

Sol. 19(c) Both the statements are required to obtain the answer.
Explanation:
B's 1 day work = $\frac{1}{20}$
I. (A+B)'s 1 day work = $\frac{1}{5}$
A's 1 day work = $\left(\frac{1}{5}-\frac{1}{20}\right)=\frac{3}{20}$
II. (B+C)'s 1 day work = $\frac{1}{10}$
Therefore, C's 1 day's work = $\left(\frac{1}{10}-\frac{1}{20}\right)=\frac{1}{20}$
From I and II
(A+B+C)'s 1 day work = $\left(\frac{3}{20}+\frac{1}{20}+\frac{1}{20}\right)=\frac{5}{20}=\frac{1}{4}$
Thus, together A, B and C can finish the work in 4 days.
Therefore, I and II both the statements are necessary to get the answer.
Therefore, correct answer is (c).

Sol. 20(d) Both the statements are insufficient to obtain the answer.
Explanation:
I. 6 (2M + 4W) = 1
12M + 24W = 1
II. 4 (3M + 6W) = 1
12M + 24W = 1
Thus, both the statements are same and hence the answer cannot be obtained.
Therefore, both the statements are insufficient to answer the question.

Sol. 21(c) Both the statements are required to obtain the answer.
I. Tank filled by Pipe A in 1 min = $\frac{1}{14}$
II. Tank emptied by Pipe B in 1 min = $\frac{1}{7}$
From I and II, part of the tank emptied in 1 min when both the pipes are opened
$=\frac{1}{7}-\frac{1}{14}=\frac{1}{14}$
Therefore, time taken to empty the tank would be 14 min.
Thus, both I and II are necessary to answer the question
Therefore, correct answer is (c).

Sol. 22(a) Statement I alone is sufficient to obtain the answer.
Explanation:
I. Time taken to fill one-third of the tank = 51 hours
Part filled in 17 hours = $\frac{17}{51}\times\frac{1}{3}=\frac{1}{9}$
II. Time taken by Pipe A to fill the tank = $\frac{B}{2}$
Statement II is insufficient to obtain the answer.

Sol. 23(c) Both the statements I and II are required to give the answer.
Explanation:
Let AB = x km. From I and II, we get:
$\frac{x}{40}-\frac{x}{60}=1\frac{30}{60}$ [As 6:00 p.m. − 4.30 p.m. = 1 hr 30 min]
$\frac{x}{40}-\frac{x}{60}=\frac{3}{2}$
Thus, value of x can be arrived.
Both the statements I and II are required to give the answer.
Therefore, the answer is (c).

Sol. 24(c) Both the statements I and II are required to give the answer.
Explanation:
The ratio of the speeds of X and Y is 3: 4.
Thus, the ratio of the time taken by X and Y will be 4 : 3.
If Y takes 72 min, then X will take $\frac{4}{3}\times 72$ = 96 min
Thus, I and II together give the answer.
Therefore, correct answer is (c).

Sol. 25(c) Both the statements are required to give the answer.
Explanation:
Let the usual speed of the train be x kmph.
From I and II,

Time taken to cover 120 km at usual speed = $\frac{120}{x}$ hrs

Time taken at increased speed = $\frac{120}{(x+10)}$ hrs

$\frac{120}{x} - \frac{120}{(x+10)} = 1$

x = 30 kmph

Thus, I and II together give the answer.

Therefore, correct answer is (c).

Sol. 26(d) I and II together are insufficient to obtain the answer.

Explanation:

Let the distance between the two stations be x km.

Let the speed of the ordinary bus be y km/hr

Then, speed of the deluxe bus = (y +12) km/hr

$\frac{x}{y} - \frac{x}{(y+12)} = \frac{30}{60}$

Both the statements are insufficient to obtain the answer.

Therefore, correct answer is (d)

Sol. 27(a) Statement I alone is sufficient to find the answer.

Explanation:

Let the whole distance be $3x$ km.

I. Time = $\frac{\text{Distance}}{\text{Speed}}$

Total time taken = $\left(\frac{x}{10} + \frac{x}{20} + \frac{x}{30}\right) = \frac{(6x+3x+2x)}{60} = \frac{11x}{60}$

Speed = $\frac{\text{Distance}}{\text{Time}} = \frac{3x}{11x/60}$ kmph = 180/11 kmph

Thus, statement I alone gives the answer.

Statement II alone does not give the answer.

Therefore, correct answer is (a).

Sol. 28(c) Both the statements are required to give the answer.

Explanation:

I. Speed of the boat upstream = $\frac{24}{6}$ km/hr = 4km/hr

II. Speed of the boat downstream = $\frac{24}{4}$ km/hr = 6 km/hr

Speed of the boat $\frac{1}{2}$(4+6) km/hr = 5 km/hr

Thus, I and II together give the answer.

Therefore, correct answer is (c).

Sol. 29(c) Both the statements are required to obtain the answer.

Explanation:

Let the speed of the boat in still water be x km/hr.

I. Speed of the current = 1 km/hr

II. AB= 4km

From I and II,

$\frac{4}{(x+1)} + \frac{4}{(x-1)} = 3$

Value of x can be obtained from the above equation.

Therefore, correct answer is (c).

Sol. 30(d) Both the statements are not sufficient to give the answer

Explanation:

Let the speed of the boat in still water be x km/hr and the speed of the river be y km/hr.

Speed downstream = $x + y$

Speed upstream = $x - y$

From I and II,

$(x + y) \times 4 = (x - y) \times 6$

Speed of boat in still water cannot be obtained from the above equation.

Thus, even both the statements I and II are not sufficient to give the answer.

Therefore, correct answer is (d).

Data Interpretation

1. LINE GRAPHS

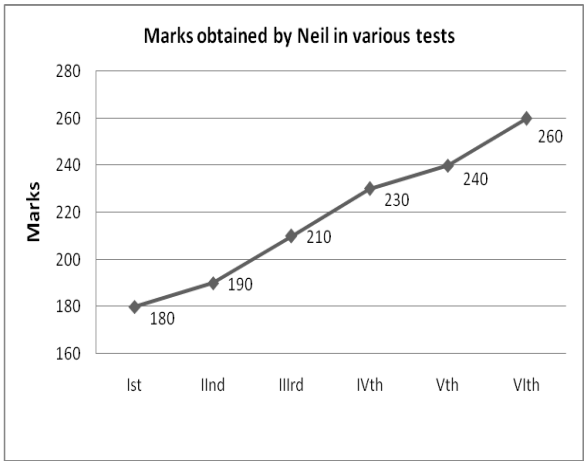
A line graph is a graph which displays information in the form of a series of data points connected by a line segment.

A line graph is bordered by two axes. The horizontal axis is called the x- axis and the vertical axis is called the y-axis. Typically the y -axis represents the dependent variable and the x -axis represents the independent variable.

An independent variable is a variable, the value of which does not depend on the occurrence of any particular event. A dependent variable, on the other hand is a variable, the value of which depends on the occurrence of a particular event. For instance, in the line graph given below, the serial numbers of different tests taken by Neil (Ist, IInd, IIIrd etc.) are the independent variables and the scores obtained by Neil in these tests represent the values of dependent variables.

Let us attempt to solve some examples to understand the concept of line graphs.

Directions for questions 1 to 7 are as follows: Neil is a civil services aspirant and a very hard working person. He has joined a test series to facilitate civil services preliminary examination preparation. The scores obtained by Neil in all the six tests are depicted by the graph given below. All the scores have been obtained out of the maximum total of 400.



Example 1:
What are the highest and the lowest scores obtained by Neil among all the scores obtained by him in the tests?
(a) 260 and 180
(b) 260 and 240
(c) 180 and 260
(d) None of the above
Sol. 1(a) 260 and 180
Explanation:
By looking at the graph it can be seen that the highest point on Y axis is 260 and the lowest point is 180.

Therefore the highest score obtained by Neil is 260 and the lowest score obtained by Neil is 180.

Example 2:
What is the average score obtained by Neil in all the tests?
(a) 210
(b) 215
(c) 218
(d) 220
Sol. 2(c) 218
Explanation:

Method I (Simple average method)
The average score obtained by Neil in all the tests

$$= \frac{\text{Total score obtained by Neil in all the tests}}{\text{Number of tests}}$$

$$= \frac{180 + 190 + 210 + 230 + 240 + 260}{6} = \frac{1310}{6}$$

=218.33 or 218 (round off)

Method II (Assumed average method)
Let us assume that the average is 220.
The average score obtained by Neil in all the tests

$$= \text{Assumed average} \pm \frac{\text{sum of differences of individual observations from the assumed average}}{\text{Number of observations}}$$

$$= 220 + \frac{-40 - 30 - 10 + 10 + 20 + 40}{6}$$

$$= 220 - \frac{10}{6} = 218.33 \text{ or } 218 \text{ (round off)}$$

Example 3:
What is the overall percentage of marks obtained by Neil in all the tests?
(a) 54%
(b) 55%
(c) 56%
(d) 57%
Sol. 3(b) 55%
Explanation:
Method I:

$$\text{Overall percentage of marks} = \frac{\text{Total score obtained in all the tests}}{\text{Total of maximum marks of all the tests}} \times 100$$

$$= \frac{1310}{2400} \times 100 =$$

54.58% or 55% (round off)

Method II:

$$\text{Overall percentage of marks} = \frac{\text{Average score}}{\text{Maximum marks}} \times 100 = \frac{218.33}{400} \times 100 = 55\ \%$$

(round off)

Example 4:
In which test there is a fall in the percentage of marks as compared to the previous test?

(a) Ist
(b) IInd
(c) IVth
(d) None
Sol.4(d) None
Explanation:

$$\text{Percentage of marks in a test} = \frac{\text{Marks obtained in a test}}{\text{Maximum marks in a test}} \times 100$$

In all the tests, the numerator (i.e. the marks obtained) is increasing and the denominator (i.e. maximum marks) remains the same. When the numerator increases and the denominator of the fraction remains the same then the value of the fraction increases and so does the percentage. Therefore, in none of the tests there is a fall in the percentage.

Example 5:
In which test Neil obtains the highest percentage increase in marks over the immediately preceding test?
(a) IIIrd
(b) IVth
(c) Vth
(d) VIth
Sol.5 (a) IIIrd
Explanation:
Increase in marks over the previous test = Marks obtained in the test − Marks obtained in the previous test
Percentage increase in marks over the previous test=

$$\frac{\text{Increase in marks over the previous test}}{\text{Marks obtained in the previous test}} \times 100$$

Method I:

$$\text{For IInd test} = \frac{190 - 180}{180} \times 100 = 5.55\%$$

$$\text{For IIIrd test} = \frac{210 - 190}{190} \times 100 = 10.53\%$$

$$\text{For IVth test} = \frac{230 - 210}{210} \times 100 = 9.52\%$$

$$\text{For Vth test} = \frac{240 - 230}{230} \times 100 = 4.34\%$$

$$\text{For VIth test} = \frac{260 - 240}{240} \times 100 = 8.33\%$$

Therefore, the highest percentage increase in marks over the immediately

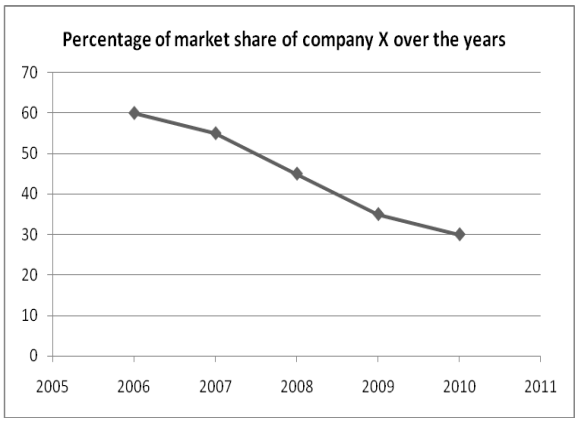
preceding test was witnessed in the IIIrd test.

Method II:
The question can also be answered with minimum calculations as follows:
Step 1- By looking at the graph, identify the maximum increase in marks over the preceding test (e.g. In IIIrd, IVth and VIth test, there is an increase of 20 marks each)
Step 2- Identify the smallest denominator out of the three denominators that are used in calculating the percentage increase in each of the three tests. It is 190 for IIIrd test.
In test III, as the numerator is the highest and the denominator is the lowest, therefore the fraction is the highest i.e. $\frac{20}{190} \times 100$ (As $\frac{20}{190} > \frac{20}{210} > \frac{20}{240}$)
Note: Method II is preferred because it avoids many unnecessary calculations and saves a lot of time during the exam.

Example 6:
Consider the following statements:
I. Neil has scored highest marks in the VIth test.
II. Neil has scored more than 50 % marks in 3 tests.
III.The score obtained by Neil has consistently improved with all the tests.
Which of the statements given above is/are correct?
(a) I and II
(b) I and III
(c) II and III
(d) I, II and III
Sol. 6(b) I and III
Explanation:
Statement I is correct because Neil has scored the highest marks in the VIth test i.e. 260 marks.
Statement II is incorrect because Neil has scored more than 50% marks (more than half i.e. 200) in four tests namely IIIrd, IVth, Vth and VIth.
Statement III is correct because the scores obtained by Neil in successive tests have increased consistently.

Example 7:
Which of the following statement can be surely concluded about the performance of Neil?
(a) Neil has maximum chances of qualifying the preliminary exam.
(b) Neil's performance is excellent.
(c) The performance of Neil has been improving over the given time period.
(d) Neil is required to take more tests.
Sol. 7(c) The performance of Neil has been improving over the given time period.
Explanation:
The scores obtained by Neil in various tests have shown an increasing trend over the given period of time. Therefore, it can be concluded that Neil's performance has been improving over the given time period. However, rest of the statements cannot be stated with full conviction by only referring to the graph.

Directions for questions 8 to 12 are as follows: The following line-graph depicts the market share of company X in its respective industry from the years 2006 to 2010. Study the graph and answer the questions that follow:



Example 8:
For how many years, the market share of the company in its industry was more than 40%?
(a) 1
(b) 2
(c) 3
(d) 4
Sol. 8(c) 3
Explanation:
The market share of the company, in its respective industry, was more than 40% for 3 years (i.e. 2006, 2007 and 2008).

Example 9:
In which year the sales of the company were the highest?
(a) 2006
(b) 2010
(c) 2006 or 2010
(d) Data inadequate
Sol. 9(d) Data inadequate
Explanation:
Sales of the company cannot be determined only on the basis of the market share of the company. To calculate the sales of the company, both the values for the market share of the company in the industry and aggregate sales of the industry are required. As the data for the aggregate sales of the industry is not available, sales of the company cannot be determined.

Example 10:
A Company is called a market leader in its industry if it has the largest share in its respective industry. In which of the following years Company X was surely the market leader in its industry?
(a) 2007
(b) 2008
(c) 2009
(d) 2010
Sol. 10(a) 2007
Explanation:
In 2007, the share of the company in its industry was more than 50 % (i.e.55 %). Therefore, in 2007 the share of every other company in the industry was less than 50%. In rest of the years mentioned in answer choices, the share of the company in the industry was less than 50 %. Therefore, there can be another company with a share of more than 50 % in the industry.

Example 11:
Which of the following statements can be made conclusively about the market share of the company?
1) The market share of the company in the industry was highest in 2006.
2) The sales of the company have declined from 2006 until 2010.
3) The market share of the company has declined from 2006 until 2010.
4) The market share of the company will fall below 20 % in the next year.

Which of the statements given above is/are correct?
(a) 1 and 2 only
(b) 1 and 3 only
(c) 1, 2 and 3
(d) 2, 3 and 4
Sol. 11(b) 1 and 3 only
Explanation:
Statement 1 is correct because in year 2006, the market share of company X was

60%. In all other years, the market share of company X was less than 60%.
Statement 2 cannot be stated with surety because the sales of the company are not given in the graph and only the market share of the company is given.
Statement 3 is correct as the market share of the company has declined from 60% (in year 2006) to 30% (in year 2010).
Statement 4 is based on the future prediction. Whether the market share of Company X will fall below 20% or not cannot be stated with full conviction.

Example 12:
Apart from the market share given in the graph, what additional information is required to calculate the sales of the company over the given time period?
(a) Total sales of the industry
(b) Total production of the company
(c) Total production of the industry
(d) None of the above
Sol. 12(a) Total sales of the industry
Explanation:
Market share of the company × Sales of the industry = Sales of the company

Directions for the questions 13 to 19 are as follows: The following line graph gives the annual profit percentage earned by a Company during the period 2007-2012. Study the line graph and answer the questions that follow.

Profit percentage earned by the Company over the years

$$\textbf{\% profit} = \frac{\textbf{Revenue} - \textbf{Expenditure}}{\textbf{Expenditure}} \times \textbf{100}$$

Example 13:
If the revenue earned by the company in 2009 was Rs. 290 crores, what was the expenditure incurred by the company in 2009?
(a) Rs. 210 crores
(b) Rs. 200 crores
(c) Rs. 180 crores
(d) Rs. 170 crores
Sol. 13(b) Rs. 200 crores
Explanation:

$$\% \text{ profit} = \frac{\text{Revenue} - \text{Expenditure}}{\text{Expenditure}} \times 100$$

$$45 = \frac{290 - \text{Exp.}}{\text{Exp.}} \times 100$$

$$\frac{45}{100}\text{Exp.} + \text{Exp.} = 290$$

$$\text{Exp.}\left(1 + \frac{9}{20}\right) = 290$$

Expenditure = Rs. 200 crores

Example 14:
What is the overall profit percentage earned by the company over the given time period?
(a) 55.7 %
(b) 55.8%
(c) 55.9%
(d) Data inadequate
Sol. 14(d) Data inadequate
Explanation:
Overall profit percentage =

$$\frac{\text{Total revenue} - \text{Total expenditure}}{\text{Total expenditure}} \times 100$$

Therefore, overall profit earned by the company cannot be calculated only on the

basis of profit percentage earned by the company for various years as figures of total revenue and total expenditure of the company are not given.

Example 15:
Which of the following data is required to calculate the overall profit percentage of the company for the given time period?
1) Revenue of the company over the given time period.
2) Expenditure of the company over the given time period.
3) Profit of the company over the given time period.
4) Profit percentage of the company over the given time period.

Which of the following combinations **can** calculate the overall profit percentage of the company?
(a) 1 and 2
(b) 1 and 4
(c) 2 and 3
(d) All the above
Sol. 15(d) All the above
Explanation:
Overall profit percentage = $\frac{\text{Total revenue} - \text{Total expenditure}}{\text{Total expenditure}} \times 100$
Overall profit percentage of the company can be calculated by statements 1 and 2 {Choice (a)}, statements 1 and 4 {choice (b)} and statements 2 and 3 {choice (c)}.
This is because choices (a), (b) and (c) can be used to calculate the overall profit percentage as the values for expenditure and revenue can be either directly put in the formula or easily determined.
Therefore, choice (d) is the correct answer.

Example 16:
For how many years, there was an increase in the profit percentage earned over the previous year?
(a) 2
(b) 3
(c) 4
(d) 5
Sol. 16(b) 3
Explanation:
During the years 2008, 2010 and 2012, the company has earned higher profit percentage over the respective previous years.

Example 17:
If the expenditure in 2007 and 2008 was equal, then the approximate ratio between the revenues of 2007 and 2008 was:
(a) 1 : 1
(b) 3 : 4
(c) 7 : 8
(d) Data inadequate
Sol. 17(c) 7 : 8
Explanation:
Let the expenditure in 2007 be x
Therefore, expenditure in 2008 = x
Also, let the incomes in 2007 and 2008 be I_7 and I_8 respectively.
Then, for the year 2007, we have;
$40 = \frac{I_7 - x}{x} \times 100 \Rightarrow \frac{40}{100} = \frac{I_7}{x} - 1 \Rightarrow I_7 = \frac{140x}{100}$ ---- (i)
And, for the year 2008, we have;
$60 = \frac{I_8 - x}{x} \times 100 \Rightarrow \frac{60}{100} = \frac{I_8}{x} - 1 \Rightarrow I_8 = \frac{160x}{100}$ ---- (ii)
From (i) and (ii), we get: $\frac{I_7}{I_8} = \frac{\frac{140x}{100}}{\frac{160x}{100}} = \frac{7}{8}$

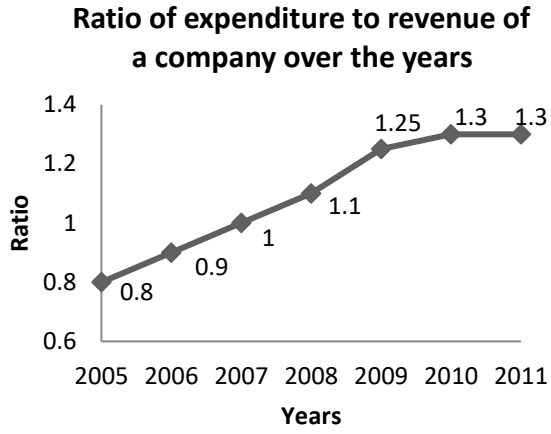
Example 18:
If the profit earned by the company in the year 2011 was Rs. 5 crores, then what was the profit earned by the company in the year 2010?
(a) Rs. 5.0 crores
(b) Rs. 4.8 crores
(c) Rs. 6.8 crores
(d) Data inadequate

Sol. 18(d) Data inadequate
Explanation:
Profit earned by the Company in 2010 cannot be calculated on the basis of the profit earned in 2011.

Example 19:
Consider the following statements:
1) The profit margin of the company is falling over the years.
2) In 2012, the company earned highest profit margin.
3) In 2007, the company earned lowest profit.

Which of the statements given above is/are correct?
(a) 1 only
(b) 2 only
(c) 1 and 3
(d) 2 and 3
Sol. 19(b) 2 only
Explanation:
Statement 1 is incorrect because the profit margin of the company has shown a mixed trend according to the graph.
Statement 2 is correct because in 2012, the company earned highest profit margin of 70%.
Statement 3 cannot be evaluated because the actual amount of profit earned by the company cannot be determined.

Directions for the questions 20 to 26 are as follows: The following line-graph gives the ratio between expenditure and revenue of the company from the year 2005 to 2011. Study the following graph and answer the questions based on the same.



Example 20:
In which of the following year was the ratio of expenditure to revenue of the company lowest?
(a) 2005
(b) 2006
(c) 2007
(d) 2008
Sol. 20(a) 2005
Explanation:
In 2005, the ratio of expenditure to the revenue of the company was lowest (ratio was 0.8).

Example 21:
In which of the following years was the ratio of revenue to expenditure of the company lowest?
(a) 2005
(b) 2007
(c) 2009
(d) 2011
Sol. 21(d) 2011
Explanation:
In year 2011, the ratio of the expenditure to the revenue of the company was highest (ratio was 1.3).
Therefore, in year 2011, the ratio of revenue to expenditure of the company was lowest.

Example 22:
For how many years the revenue earned by the company was more than the expenditure incurred by the company?
(a) 1
(b) 2
(c) 3
(d) 4
Sol. 22(b) 2
Explanation:
If expenditure/revenue is < 1, then the revenue of the company is more than its expenditure. In 2005 and 2006 the ratio of expenditure to revenue is 0.8 and 0.9 respectively. Therefore, for 2 years revenue is more than the expenditure.

Example 23:
If the expenditure of the Company in 2006 was Rs. 180 crores, then the revenue
of the Company in 2006 was:
(a) Rs. 162 crores
(b) Rs. 198 crores
(c) Rs. 200 crores
(d) Rs. 220 crores
Sol. 23(c) Rs. 200 crores
Explanation:
Expenditure/Revenue = 0.9 (ratio given for the year 2006)
180/Revenue = 0.9
180/0.9 = Revenue
Revenue of the company in the year 2006 = Rs. 200 crores

Example 24:
What was the percentage decrease in revenue of the company from the year 2005 to 2011?
(a) 72
(b) 56
(c) 28
(d) Data inadequate
Sol. 24(d) Data inadequate
Explanation:
As revenues earned during different years are not given, percentage decrease in revenue cannot be calculated.

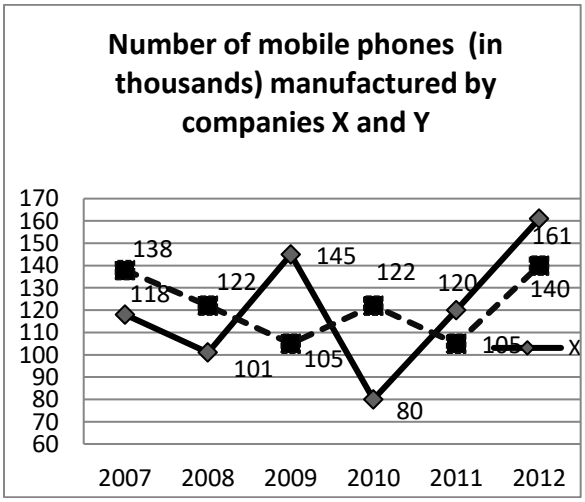
Example 25:
If the revenue earned in 2011 was Rs. 300 crores and the total expenditure in 2010 and 2011 taken together was Rs. 650 crores, then the revenue in 2010 was:
(a) Rs. 200 crores
(b) Rs. 250 crores
(c) Rs. 300 crores
(d) Rs. 420 crores
Sol. 25(a) Rs. 200 crores
Explanation:
Expenditure in year 2011 = Revenue in year 2011 × Ratio of expenditure and revenue in year 2011 = 300 × 1.3 = Rs. 390 crores
Expenditure in year 2010 = Expenditure in the years 2011 and 2010 – Expenditure in the year 2011 = 650 – 390 = Rs. 260 crores
Revenue in the year 2010 = $\frac{\text{Expenditure in the year 2010}}{\text{Ratio (for the year 2010)}} = \frac{260}{1.3}$ = Rs.200 crores

Example 26:
Consider the following statements:
1) There has been a consistent fall in the revenue of the company over the given period of time.
2) The company is suffering losses since 2008. (Loss = Expenditure – Revenue)
3) The expenditure of the company has increased over the given period of time.

Which of the statements given above is/are correct?
(a) 1 only
(b) 2 only
(c) 1 and 3
(d) 2 and 3
Sol. 26(b) 2 only
Explanation:

Statement 1 cannot be evaluated because the revenue figures of the company cannot be determined.
Statement 2 is correct because the expenditure is more than the revenue of the company since 2008.
Statement 3 cannot be evaluated because the expenditure figures of the company cannot be determined.

Directions for questions 27 to 33 are as follows: The two companies X and Y are one of the largest producers of mobile phones in the economy. The following line graph depicts the production of mobile phones by two companies for the time period 2007 to 2012. Study the following line-graph and answer the questions based on the same.



Y-axis measures the number of mobile phones manufactured by Companies X and Y

Example 27:
What is the difference between the number of mobile phones manufactured by Company Y in year 2012 and year 2009?
(a) 35
(b) 3,500
(c) 35,000
(d) 3,50,000
Sol. 27(c) 35,000
Explanation:
Mobile phones manufactured by company Y in year 2012 – Mobile phones manufactured by company Y in year 2009 = 1,40,000 – 1,05,000 = 35,000 mobile phones.

Example 28:
What is the average number of mobile phones manufactured by company Y over the given time period?
(a) 119,333
(b) 122,000
(c) 125,000
(d) None of the above
Sol. 28(b) 122,000
Explanation:
Method I (Simple average method)
Average $= \frac{\text{Sum of observations}}{\text{Number of observations}} = \frac{(138 + 122 + 105 + 122 + 105 + 140)}{6} = \frac{732}{6} = 122$
Average number of mobile phones manufactured by company Y = 122 × 1,000 = 122,000
(Average obtained is multiplied by 1,000 because the data about the production of mobile phones is given in thousands.)

Method II (Assumed average method)
Let us assume that the average number of mobile phones manufactured by company Y is 125,000.
Average $=$ Assumed average $\pm \frac{\text{sum of differences of ind.observations from assumed average}}{\text{Number of observations}}$
$= 125 \pm \frac{+13 - 3 - 20 - 3 - 20 + 15}{6} = 125 - \frac{18}{6} = 125 - 3 = 122$ or 122,000 (because the data is given in thousands)

Example 29:

In which of the following year, the difference between the productions of Company X and Company Y was the highest?
(a) 2009
(b) 2010
(c) 2011
(d) 2012
Sol. 29(b) 2010
Explanation:
Method I
To find out the year in which there was the highest difference between the productions of company X and Y, those years need to be identified where the gap between the two curves appear be the maximum. From the graph there can be confusion between two years 2009 and 2010.
Therefore, difference between the values on both the curves for the years 2009 and 2010 can be calculated.
For year 2009, it is 145 – 105 = 40
For year 2010, it is 122 – 80 = 42
Therefore, the maximum difference between the production of company X and Y was in the year 2010.
Method II
Calculate the difference in production between company X and company Y for all the years and then identify the year where the difference in production of company X and Y was the maximum.
Method I is preferred because it avoids lengthy and time consuming calculations.

Example 30:
What is the difference in the total production of company Y and company X in the given years?
(a) 7,000
(b) 8,000
(c) 9,000
(d) 10,000
Sol. 30(a) 7,000
Explanation:
Total production of company Y in the given time period = 732,000
Total production of company X in the given time period = 725,000
Difference in the total production of two companies = 7,000 mobile phones

Example 31:
The production of company Y in 2011 was approximately what percent of the production of company X in the same year?
(a) 115 %
(b) 107.5 %
(c) 97.5 %
(d) 87.5 %
Sol. 31(d) 87.5 %
Explanation:
$$\frac{\text{Production of company Y in 2011}}{\text{Production of company X in 2011}} \times 100$$
$$= \frac{105}{120} \times 100 = 87.5\ \%$$

Example 32:
For how many years, the production of company Y was higher than that of company X?
(a) 2
(b) 3
(c) 4
(d) 5
Sol.32(b) 3
Explanation:
The production of company Y was higher than that of company X in the years 2007, 2008 and 2010.

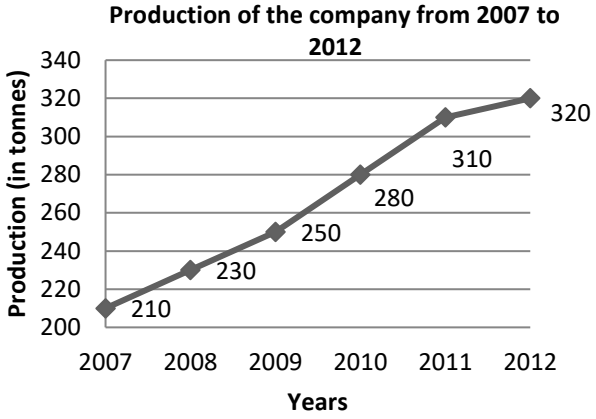
Example 33:
Consider the following statements:
1) The fluctuation in production of company X was more than that of company Y.
2) The sales of company X were highest in 2012.
3) The sales of the company Y were lowest in 2010.

Which of the statements given above is/are correct?
(a) 1 only
(b) 2 and 3 only
(c) 1, 2 and 3
(d) None of the above
Sol. 33(a) 1 only
Explanation:
Statement 1 is correct because it is visible from the graph that the variation in the curve representing the production of company X is more than the variation in the curve representing the production of company Y.
Statements 2 and 3 cannot be evaluated because sales of the companies cannot be determined on the basis of production figures.

Let us now attempt the practice exercise to master the concept of Line Graphs.

PRACTICE EXERCISE

Directions for questions 1 to 6 are as follows: The following line graph represents the production of a company for the time period 2007 to 2012. Study the graph and answer the questions based on the same.



1. What is the minimum and maximum production of the company in the given time period?
(a) 210 and 320
(b) 310 and 320
(c) 210 and 230
(d) None of the above

2. What is the average production of the company in the given time period?
(a) 260
(b) 263
(c) 267
(d) 270

3. In which year there is a fall in production of the company over the previous year?
(a) 2008
(b) 2009
(c) 2010
(d) None

4. In which year there is highest percentage increase in production of the company over the previous year?
(a) 2008
(b) 2009
(c) 2010
(d) 2011

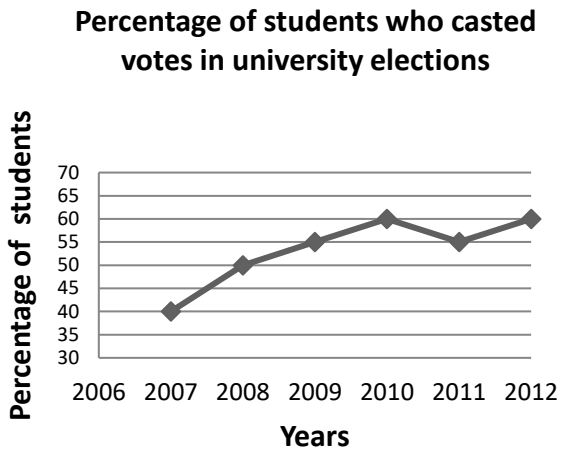
5. Consider the following statements:
1) Production of the company is maximum in the year 2012.
2) For more than three years, the production of the company is more than the average production.
3) The production of the company has shown an increasing trend.

Which of the statements given above is/are correct?
(a) 1 and 2
(b) 1 and 3
(c) 2 and 3
(d) 1,2 and 3

6. Which of the following can be surely concluded about the performance of the company?
(a) The profits of the company have risen every year.
(b) The company is emerging as the largest producer in the industry.
(c) The production of the company has risen over the time period.
(d) The sales of the company have risen every year.

Directions: The following line-graph represents the percentage of students of a university who casted votes in six elections held in the university from year 2007 to 2012. Study the graph and answer the questions based on the

graph.



7. In how many elections, more than 50% students of the university exercised their vote?
(a) 2
(b) 3
(c) 4
(d) None of the above

8. In which year there was maximum number of voters?
(a) 2006
(b) 2008
(c) 2010
(d) Data inadequate

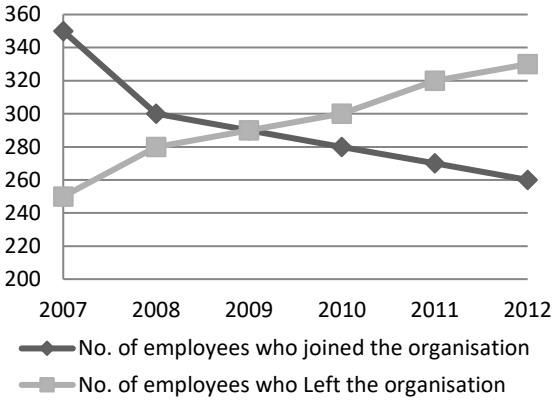
9. If the number of voters in year 2012 was 1200, then find the number of students in the university in year 2012?
(a) 1900
(b) 2000
(c) 2100
(d) Data inadequate

10. Consider the following statements:
1) The percentage of student participation in elections has increased over the years.
2) The number of students casting their votes in university elections has increased over the given time period.
3) In the year 2007, 60% of the students of the university didn't cast votes.
4) In the year 2012, 60 % of the students of the university casted votes.

Which of the statements given above is/are correct?
(a) 1 and 2 only
(b) 1 and 4 only
(c) 1, 3 and 4
(d) 1, 2, 3 and 4

11. Apart from the percentage of students who casted votes, what other information is required to find the number of students in the university in a particular year?
(a) Total number of students who didn't cast their vote in a particular year.
(b) Percentage of voters who didn't cast their vote in the elections in a particular year.
(c) Increase in strength of the students of the university each year.
(d) None of the above

Directions: Study the following line-graph which shows the number of employees who joined and left the organization within a span of six years, from 2007 to 2012.The initial strength of the organization in the beginning of the year 2007 was 800 employees.



12. The number of employees serving the organization at the end of year 2012 was:
(a) 760
(b) 780
(c) 800
(d) 820

13. During which of the following years, the strength of the organization was more than 900 but less than 950?
(a) 2007 and 2008
(b) 2008 and 2009
(c) 2009 and 2010
(d) 2010 and 2011

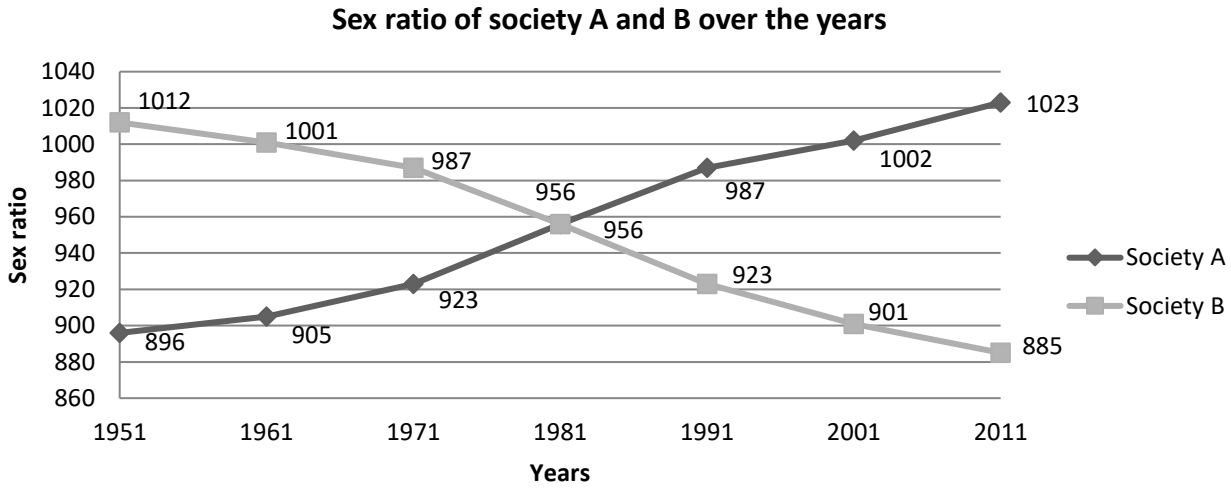
14. In which of the following years did the largest addition to the existing number of employees take place?
(a) 2007
(b) 2008
(c) 2009
(d) 2010

15. In which year did the organisation have the maximum number of employees in the given period of time?
(a) 2007
(b) 2009
(c) 2010
(d) 2011

16. The number of employees working in the organization at the end of year 2012 was what percentage of the number of employees working in the organization at the beginning of year 2007?
(a) 95.0%
(b) 97.5%
(c) 102.5%
(d) None of the above

17. The ratio of the least number of employees who joined the organization to the maximum number of employees who left the organization in any of the years during the given period of time is:
(a) 26 : 33
(b) 33 : 26
(c) 35 : 25
(d) 25 : 35

Directions for the following questions: The following line graph depicts the sex ratio of two societies A and B from the period 1951 to 2011. Sex ratio refers to the number of females per thousand of males. Study the line graph and answer the following questions based on the line-graph:



18. In which of the following years, the ratio of females to males in society A was minimum?
(a) 1951
(b) 1981
(c) 2011
(d) None of the above

19. In how many of the given years was the number of females greater than the number of males in society B?
(a) 2
(b) 4
(c) 5
(d) 7

20. If the number of males in society A in the year 2001 is 100,000, find the number of females in society A in the year 2001?
(a) 98,000
(b) 100,000
(c) 100,200
(d) 102,000

21. What is the approximate percentage decrease in the number of females in society B over the given time period?
(a) 15 %
(b) 18 %
(c) 21%
(d) Data inadequate

22. Which of the following statements can be stated with 100% certainty?
1) There has been a consistent fall in the number of females in society A.
2) There has been a consistent fall in the number of females in society B.
3) In the year 1981, the number of males in society A and B taken together is greater than the number of females in society A and B.
4) In the year 2011, the number of females in society A and B taken together is greater than the number of males in society A and B.

Select the correct answer using the codes given below:
(a) 3 only
(b) 1 and 2 only
(c) 2, 3 and 4 only
(d) 1,2,3 and 4

ANSWER KEY: DATA INTERPRETATION

1. LINE GRAPHS

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

Solutions: LINE GRAPHS

Sol. 1 (a) 210 and 320
Explanation:
According to the graph, the minimum production of the company is 210 tonnes and the maximum production of the company is 320 tonnes.

Sol. 2 (c) 267
Explanation:
Average production of the company for all the years
$= \frac{\text{Total production by the company for all the years}}{\text{Number of years}}$
$= \frac{210 + 230 + 250 + 280 + 310 + 320}{6} = \frac{1600}{6} =$ 266.67 or 267 tonnes (round off)

Sol. 3 (d) None
Explanation:
In all the given years, production of the company has increased in the current year as compared to the production in the previous year. Therefore, in none of the years there has been a fall in production as compared to the previous year.

Sol. 4 (c) 2010
Explanation:
Increase in production over the previous year's production = Production in a particular year– Production in the previous year
Percentage increase in production over the production in previous year=
$\frac{\text{Increase in prod. over prod. in previous year}}{\text{Production in previous year}} \times 100$

Method I:
For 2008 $= \frac{230 - 210}{210} \times 100 = 9.52\%$
For 2009 $= \frac{250 - 230}{230} \times 100 = 8.69\ \%$
For 2010 $= \frac{280 - 250}{250} \times 100 = 12.0\ \%$
For 2011 $= \frac{310 - 280}{280} \times 100 = 10.71\%$
For 2012 $= \frac{320 - 310}{310} \times 100 = 3.22\%$
Therefore, in year 2010, there was highest percentage increase in production over the production in year 2009.

Method II:
The question can also be answered with minimum calculations. The aim is to find out the highest fraction which can be done as follows:
Step 1- Identify the highest increase in production over the production in the previous year (In years 2010 and 2011, there is an increase of 30 tonnes in the production each year over the production in the previous year)
Step 2- Select the smallest denominator out of the two denominators in question, Therefore select the smaller amount from 2009 and 2010 production figures (which is 2009's production of 250 tonnes)
As the numerator is highest and the denominator is smallest, therefore the proportion is the largest i.e. $\frac{30}{250} \times 100$ (As $\frac{30}{250} > \frac{30}{280}$)

Method II is preferred because it involves fewer calculations and saves the precious time of the student during the exam.

Sol. 5 (b) 1 and 3
Explanation:
Statement 1 is correct because the production of the company is maximum in the year 2012 (i.e. 320 tonnes).
Statement 2 is incorrect because the production of the company was more than the average production for exactly three years. (Average production = 266.67 tonnes)

Statement 3 is correct because the graph indicates that the production of the company has increased over the years.

Sol. 6 (c) The production of the company has risen over the time period.
Explanation:
Clearly, from the graph the production of the company has risen over the time period. Rest of the statements cannot be concluded from the graph.

Sol. 7 (c) 4
Explanation:
During the elections held in the years 2009, 2010, 2011 and 2012, more than 50% students of the university casted votes.

Sol.8 (d) Data inadequate
Explanation:
Number of voters cannot be determined just on the basis of percentage of voters.

Sol. 9 (b) 2000
Explanation:
$$\frac{\text{Number of voters in 2012}}{\text{Number of students in 2012}} \times 100 = 60$$
$$\Rightarrow \frac{\text{Number of voters in 2012}}{\text{Number of students in 2012}} = \frac{60}{100}$$
$$\Rightarrow \frac{1200}{\text{Number of students in 2012}} = \frac{60}{100}$$
$$\Rightarrow \frac{1200 \times 100}{60} = \text{Number of students in 2012}$$
Therefore, Number of students in 2012 = 2000

Sol. 10 (c) 1, 3 and 4
Explanation:
Statement 1 is correct because the percentage of students who casted votes has increased over the given time period from 40 % to 60 %.
Statement 2 cannot be evaluated because total number of voters in student elections are not known. Only percentage of students who participated in the elections is given.
Statement 3 is correct because in 2007, 40 % of the students casted votes. Therefore, 60 % of the students did not cast votes.
Statement 4 is correct because in 2012, 60 % of the students casted votes.

Sol. 11 (a) Total number of students who didn't cast votes in a particular year.
Explanation:
100 % − percentage of students who casted votes = percentage of students who didn't cast votes.

From the number of students who didn't cast votes and their percentage composition in the total students, we can calculate the total number of students in the university in any particular year.

Sol. 12 (b) 780
Explanation:
Number of employees at the end of each year = Number of employees at the beginning of each year + Number of employees who joined the organization during the year – Number of employees who left the organization during the year
No. of employees at the end of 2007 = 800 + 350 – 250 = 900
No. of employees at the end of 2008 = 900 + 300 – 280 = 920
No. of employees at the end of 2009 = 920 + 290 – 290 = 920
No. of employees at the end of 2010 = 920 – 300 + 280 = 900
No. of employees at the end of 2011 = 900 – 320 + 270 = 850
No. of employees at the end of 2012 = 850 – 330 + 260 = 780

Sol. 13 (b) 2008 and 2009

Explanation:
Calculations are done in the previous solution.

Sol. 14 (a) 2007
Explanation:
In 2007, net addition of employees to the existing number of employees in the organization was 100 (Net addition = Joined – Left)

Sol. 15 (b) 2009
Explanation:
According to the calculations done under the solution of question 12, the company had the maximum number of employees in 2009 or 2008 (920 employees). As 2008 is not mentioned in the answer choices, 2009 is the answer.

Sol. 16 (b) 97.5 %
Explanation:

$$\frac{\text{No. of employees at the end of 2012}}{\text{No. of employees at the beginning of 2007}} \times 100 = \frac{780}{800} \times 100 = 97.5\ \%$$

Sol. 17 (a) 26: 33
Explanation:
Minimum number of employees who joined the organization in any of the given years : Maximum number of employees who left the organization in any of the given years
260 : 330
26 : 33

Sol. 18(a) 1951
Explanation:
In 1951, the sex ratio (or the ratio of females to males) was the minimum in society A. The ratio was 896: 1000.

Sol. 19(a) 2
Explanation:
When the sex ratio is greater than 1000, then the number of females is more than the number of males. In years 1951 and 1961 sex ratio is more than 1000 in society B.

Sol. 20(c) 100,200
Explanation:

$$\frac{\text{No. of females in society A in year 2011}}{\text{No. of males in society A in year 2011}} = \frac{1002}{1000}$$

$$\text{No. of females in society A in year 2011} = \frac{\text{No. of males in society A in year 2011} \times 1002}{1000}$$

$$\Rightarrow \frac{100{,}000 \times 1002}{1000} = 100{,}200$$

Sol. 21 (d) Data inadequate
Explanation:
As the number of females is not known during all the years, therefore percentage decrease in the number of females cannot be determined.

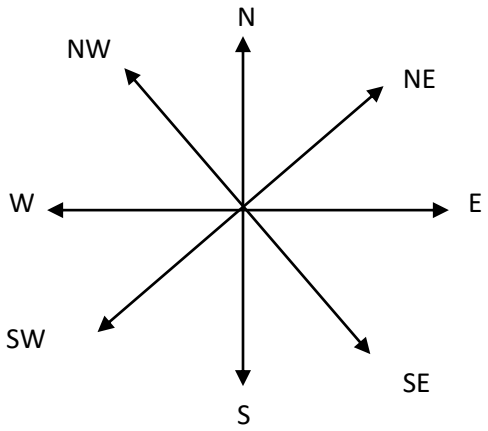
Sol. 22 (a) 3 only
Explanation:
Both statements 1 and 2 cannot be evaluated because number of females is not known.
Statement 3 is correct because the sex ratio for both the societies A and B is less than 1000 in the year 1981.
Statement 4 cannot be evaluated because though the number of females is more than the number of males in society A in the year 2011, the number of females is less than the number of males in society B in the year 2011 and the figures of males and females for both the societies are not given.
Therefore, in the above given statements only statement 3 can be stated with 100 % certainty.

REASONING

1. DIRECTION SENSE

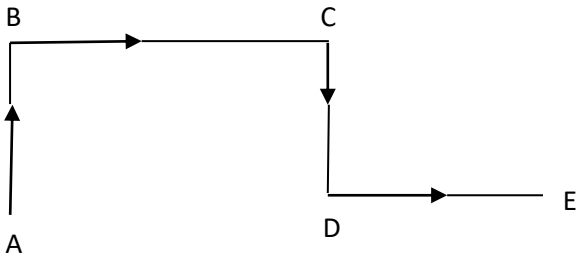
This chapter tests a candidate's direction sense. The candidate is required to read a series of instructions relating to an object which is constantly changing directions and then either determine the final direction in which the object is travelling or the distance travelled by the object (usually from the starting point).

The figure given below indicates the positions of various directions and will help the candidate to develop a direction sense.

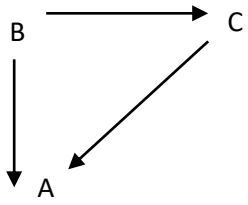


Let us attempt to solve the following examples to develop a direction sense.

Example 1:
A person travels in the north direction, then turns right, then again turns right and thereafter turns left. In which direction is the person travelling now?
(a) North
(b) South
(c) East
(d) West
Sol. 1 (c) East
Explanation:
The movement of the person is indicated in the figure given below (from A to B, B to C, C to D and D to E). The final movement is in the direction indicated by the line segment DE, which is towards the East direction.

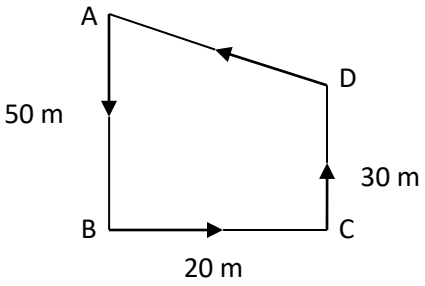


Example 2:
If A is to the south of B and C is to the east of B, what is the direction of A with respect to C?
(a) North-east
(b) South-east
(c) North-west
(d) South-west
Sol. 2 (d) South-west
Explanation:
From the figure given below, A is south-west of C.

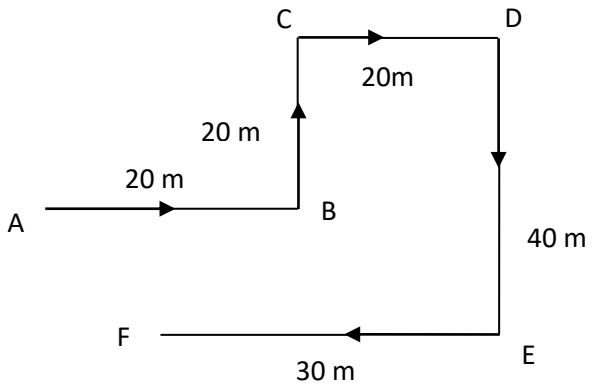


Example 3:
A runs 50 m south from her house. Then, she turns left and runs 20 m more, then she turns towards North and runs 30m further and then finally she starts walking towards her house on the shortest possible route. In which direction is she walking now?

(a) West
(b) South-east
(c) North-west
(d) None of the above
Sol. 3 (c) North-west
Explanation:
The movement of A is shown in the figure given below (A to B, B to C, C to D and D to A).She is walking from D to A in the North-west direction.



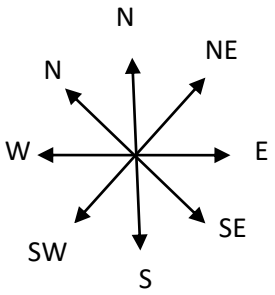
Example 4:
P is facing North direction. He then turns right and walks 20 m. He then turns to his left and walks 20 metres. Next, he moves 20 metres to his right. He then turns to his right again and walks 40 metres. Finally, he turns to his right and moves 30 metres. In which direction is he now with respect to his starting point?
(a) South-west
(b) South
(c) North-west
(d) South-east
Sol. 4 (d) South-east
Explanation:
Let us assume that P starts from point A. He turns right and walks 20m towards east upto point B, turns left and moves 20m upto point C, turns right and moves 20m upto point D. At D where he is facing East, he takes a right turn and turns towards south and walks 40m upto E. Next, he again turns right and walks 30m upto F, his final position. F is south-east of A. Therefore, P is south-east of his starting point.



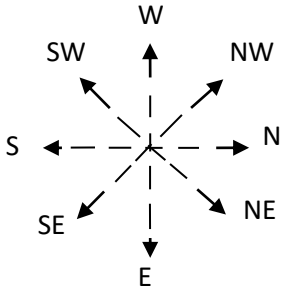
Example 5:
A direction pole was situated on a crossing. Due to an accident the pole turned in such a manner that the pointer which indicated East direction, was now pointing towards South. According to the pointer, one traveler was travelling in the north direction. In which direction was he actually travelling?
(a) North
(b) South
(c) East
(d) West
Sol. 5 (c) East
Explanation:
The directions on the correct pointer and the incorrect pointer are shown in the figure given below.

North direction according to the incorrect pointer is actually the West direction.

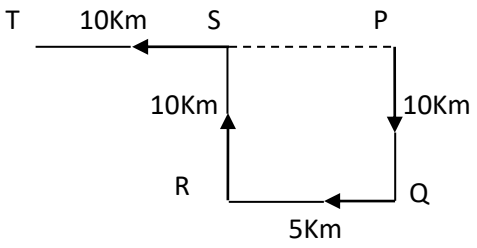
Correct Pointer



Incorrect Pointer

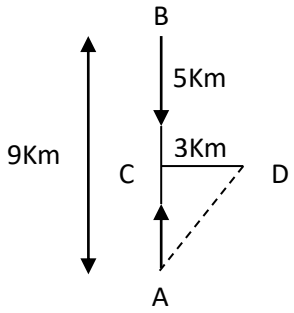


Example 6:
One day, A left home and cycled 10km southwards, turned right and cycled 5 km, turned right again and cycled 10km and finally, turned left and cycled 10km.What is the minimum distance A is required to travel to reach back home from this point?
(a) 10km
(b) 15km
(c) 20km
(d) None of the above
Sol. 6 (b) 15 km
Explanation:



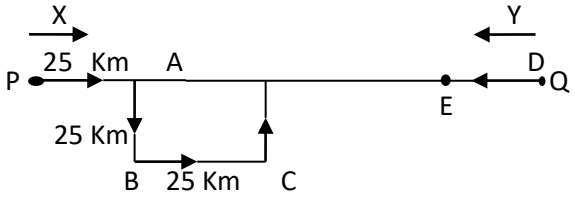
A starts from point P (home), moves 10km southwards uptill Q, turns right and moves 5km uptill R, turns right again and moves 10km uptill S and finally turns left and moves 10km uptill T.
A's distance from initial position = PT = PS + ST = QR (because PS = QR) + ST = 5 km +10 km = 15 km

Example 7:
A person walks 9 km towards North. From there he walks 5 km towards South. Then, he walks 3 km towards East. How far and in which direction is he with respect to his starting point?
(a) 5 km North-east
(b) 7 km North-east
(c) 5 km South-west
(d) 5 km South-west
Sol. 7 (a) 5 km North-east
Explanation:
The person walks 9 km northwards from A to B, then walks 5 km southwards upto C, then turns towards East and walks 3 km upto D
Then, AC = (AB − BC) = (9 − 5) = 4 km
CD = 3 km
Distance from the starting point = $\sqrt{AC^2 + CD^2} = \sqrt{4^2 + 3^2}$ = 5 km
Also, D is North-east of A
Therefore, choice (a) is the correct answer.



Example 8:
Two cars start moving towards each other from two opposite points 150 km apart on a main road. The first car covers 25 km on the main road, takes a right turn and then covers 25 km more. It then turns left and covers another 25kms and then turns to reach the main road. In the meantime, due to a minor breakdown, the other car has covered only 40 km along the main road. What is the remaining distance between the two cars?
(a) 35 km
(b) 50 km
(c) 60 km
(d) None of the above
Sol. 8 (c) 60 km
Explanation:
Let X and Y be two cars
Car X travels along the path PA, AB, BC and CD.
Now, AD = BC = 25 km
Distance travelled by car X on the main road = PD
PD = PA + AD = 50 km
Distance travelled by car Y = QE = 40 km

Therefore, distance between the two cars = PQ − (PD+QE) = [150 − (50+40)] km = 60 km



Let us now attempt the practice exercise to master the problems on direction sense.

PRACTICE EXERCISE

1. A is 50m South-west of B. C is 50m South-east of B. Then, what is the direction of C with respect to A?
(a) North
(b) East
(c) North-east
(d) None of the above

2. A person walks 40 metres in the North-west direction from his house and then walks 40 metres in the South-west direction. Next, he walks 40 metres in the South-east direction. Finally, he starts walking towards his house. In which direction is he moving?
(a) North-east
(b) South-east
(c) South-west
(d) None of the above

3. There are four towns P, Q, R and T. Q is situated at South-west of P, R is at the east of Q and South-east of P, and T is at the north of R. In which of the following direction T **cannot** be located with respect to P?
(a) North
(b) East
(c) North-east
(d) South- east

4. S starts walking towards east. After walking 125 metres, he turns left and walks 25 metres. Again he turns left, walks a distance of 80 metres, again he turns left and walks 25 metres. How far is he from the starting point?
(a) 25 m
(b) 35 m
(c) 40 m
(d) 45 m

5. A boy started travelling from his house towards the market located 5 km away in North-east direction. From there he went to his friend's house situated 4 km south of the market. How far and in what direction is he from his house?
(a) 3 km in North
(b) 3 km in East
(c) 4 km in East
(d) 4 km in West

6. A lady lost her purse. She went 90 metres east to a shop before turning to her right. Again, she went 20 metres ahead before turning to her right. Thereafter, she walked 30 metres further to reach his uncle's place. From there, she went 100 metres north to a street where she found her purse. How far from the starting point did she find her purse?
(a) 60 metres
(b) 100 metres
(c) 140 metres
(d) None of the above

7. Two cars, X and Y, 100 km apart start moving towards each other with the same speed on a main road. After covering 30 km, car Y turns left and covers 10 km and then turns right and covers 20 km. Then, it again turns right and comes back on the main road. In the meantime car X continues to move on the main road. What is the final distance between the two cars?
(a) 10 km
(b) 15 km
(c) 20 km
(d) 25 km

8. Directions: Study the information given below and answer the questions that follow:
A, B, C, D, E, F, G, H and I are nine general merchandise stores in an area. C is 4 km east of B. A is 2 km north of B and H is 4

km south of A. G is 2 km west of H while D is 6 km east of G and F is 4 km north of G. I is situated in the middle of B and C while E is situated in the middle of H and D.

8. 1. Distance between E and G is
(a) 2km
(b) 3km
(c) 4km
(d) 5km

8.2. Distance between E and I is
(a) 2km
(b) 4km
(c) 6km
(d) 8km

ANSWER KEY : REASONING

1. DIRECTION SENSE

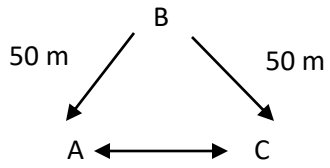
1. (b)
2. (a)
3. (a)
4. (d)
5. (b)
6. (b)
7. (c)

8.1 (c)

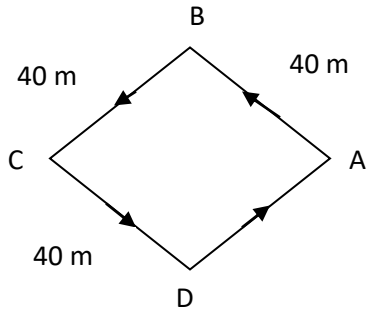
8.2 (a)

Solutions: DIRECTION SENSE

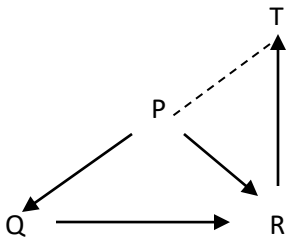
Sol. 1 (b) East
Explanation:
The positions of A, B and C are shown in the diagram given below. C is located in the east of A.



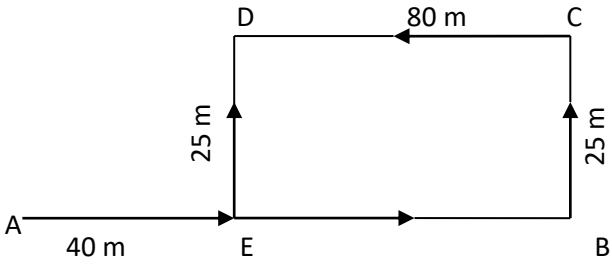
Sol. 2 (a) North-east
Explanation:
The movements of the person are shown in the figure given below (A to B, B to C, C to D and D to A).Finally the person is moving from D to A in the North-east direction.



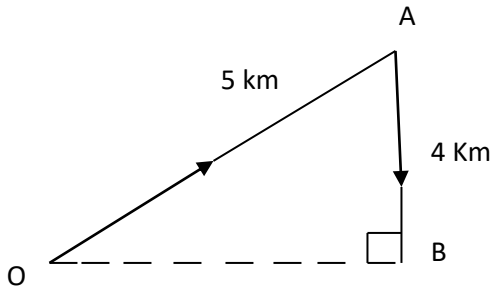
Sol. 3 (a) North
Explanation:
T cannot be in the north of P. T can be in the east, north-east or south-east of P depending on how far is T from R.



Sol. 4 (d) 45 m
Explanation:
The movement of S is shown in the figure given below.
S's distance from the starting point A
= AB – EB (EB = DC = 80 m)
= 125m – 80m = 45m

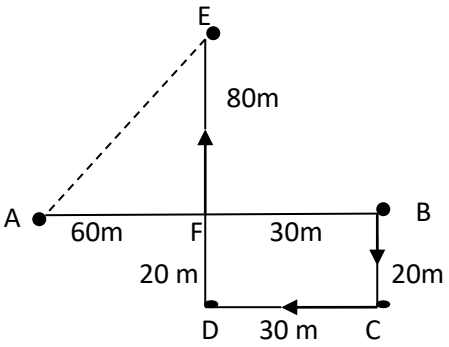


Sol. 5 (b) 3 km in East
Explanation:
The movement of the boy is shown in the figure given below (from O to A, A to B).
ΔOBA is right-angled at B
According to Pythagoras theorem: $OA^2 = OB^2 + AB^2$
$OB^2 = OA^2 - AB^2$
$OB = \sqrt{(25 - 16)}$ km $= 3$ km
Boy is 3 km in the east of his initial position O.

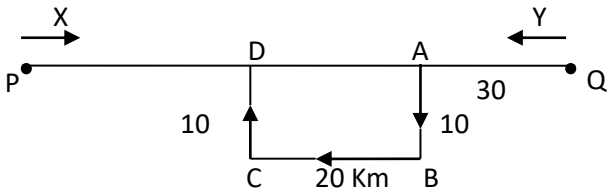


Sol. 6 (b) 100 metres
Explanation:
The lady starts from pt. A and walks 90m eastwards upto pt. B, then turns right and walks 20m upto pt. C, then turns right and walks 30m upto pt. D. Finally, she turns right and walks 100m upto pt. E.

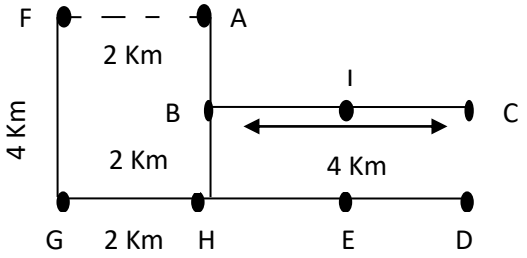
AB = 90m, BF = CD = 30m
AF = AB – BF = 60m
DE = 100m, DF = BC = 20m
EF = DE – DF = 80m
Distance from the starting point A = AE = $\sqrt{AF^2 + EF^2}$
= $\sqrt{(60)^2 + (80)^2}$ = $\sqrt{3600 + 6400}$ = $\sqrt{10{,}000}$ = 100m



Sol. 7 (c) 20 km
Explanation:
Y moves 30 km from Q to A, then 10 km upto pt. B, 20 km upto pt. C and then 10 km upto pt. D.
AD = BC = 20 km
QD = 30 km + 20 km = 50 km
As X and Y travel with the same speed, X and Y travel the same amount of distance, i.e. (30 + 10 + 20 + 10) km = 70 km
X travelled 70 km along the road and Y travelled 50 km along the road. The road length is 100 km. Therefore, both the cars have crossed each other and are separated by 20 km.



8.



Sol.8.1 (c) 4km
Explanation:
As E is located in the middle of H and D, so HE = ED
HD = 4km. Therefore, HE= ED = 2km
Required distance = GE = GH + HE= (2 + 2) km = 4 km

Sol.8.2 (a) 2km
Explanation:
I is located in the middle of B and C as E is located in the middle of H and D.
Therefore, required distance = EI = HB = 2 km