Important Tips to Crack Percentage Questions

Percentage is a way of expressing a number as a fraction of 100 (per cent meaning "per hundred"). It is often denoted using the percent sign, "%". This concept is pretty useful for comparison of fractions as all the fractions are indexed to 100 when converted to percentages. Any percentage can be expressed as a fraction or a decimal fraction and vice versa.

For example, fractions such as 3/5 can be written as 0.6 or 60% and vice versa.

The most important point to be noted here is that percentages are meaningless unless we have information about the base over which it is calculated.

Percentage value = [Actual value/Base

value] x 100 Other Important Concepts:

1. When a number is increased by 1/x times, we should decrease the number by 1/(x+1) times in order to bring it back to the original level. Similarly, when a number is decreased by 1/x times, we should increase the number by 1/(x-1) times in order to bring it back to the original level.

This concept is particularly useful in solving problems involving price increase and corresponding decrease in quantities.

Let us take an example to understand this concept.

A family consumes 5 kg of rice every month at Rs. 20/ kg. What will be the new consumption of rice in kg if the price increases by 20%, so that their expenditure on rice remains the same?

We know that,

Total expenditure on the commodity = price of the commodity × quantity consumed

When the price of one kg of rice increases by 20% and if the quantity consumed remains the same, we know that the expenditure on rice will also increase by 20% or 1/5times. So, to bring expenditure back to the original level, we need to decrease the quantity consumed by 1/4 times or 25%. Hence, new consumption of rice in kg will be the product of old consumption and the multiplication factor for 25% decrease (which is 0.75). Hence, new consumption of rice in kg = 5 × 0.75 = 3.75

To generalize, when the price is increased by 1/x times, the consumption should be decreased by 1/(x+1) times and vice-versa in order to keep the total expenditure constant.

2. If a number is doubled, the percentage increase is 100%. Similarly if a number is increased to n times the original value, the percentage increase is ((n-1) × 100) %. For example, if a number is increased to 8 times its value, the percentage increase is 700%.

3. If a quantity is increased by p% and then decreased by p%, then there will always be a net decrease which is equal to p^2/100%. For example, from 100 if 10% is increased, we get 110 and then decreased by 10%, we get 99 instead of 100, which is 1% decrease from 100. It can also be solved as 10^2/100 decrease, which is 1% decrease.

4. In any problem involving percentages, when the actual quantity is not given you can assume it as 100 and proceed to solve the problem.

Example: When a number is increased by 20% and decreased by 25%, what is the effective percentage decrease / increase?

In such problems, since the actual number is not given, we can assume the number as 100 and subject it to the necessary changes. The difference between the resulting number and 100 gives the percentage increase or decrease.

Important Tips to Crack Simple Interest & Compound Interest Questions

Simple interest

Simple interest is calculated only on the principal amount, or on that portion of the principal amount which remains unpaid.

Simple interest = Pnr/100

Amount is the sum of principal and interest and is given by,
A = P + [(Pnr/100)]

Compound interest

When the interest is added to the principal at the end of each period to arrive at the new principal for the next period it is termed as compound interest.

Under compound interest, the amount at the end of the first year will become principal for the second year; the amount at the end of the second year becomes the principal for the third year and so on.

Amount after 'n' years = P (1 +

r/100)^n I = P [(1+r/100)^n – 1]

The frequency with which the interest is compounded can be different. If the interest is added to the principal every six months, then it is said to be compounded half yearly or twice a year. Similarly, if the interest is calculated and added four times in a year, then it is said to be compounded quarterly.

For example, if Rs. 8000 is lent at the rate of 12% per annum and compounded every three months, then the amount at the end of the year is calculated as follows:

The interest for 12 months is 12%.

Therefore for 3 months, the effective rate of interest is

12/4 = 3. Also, the compounding is done 4 times instead

of 1 time.

Therefore the amount = 8000 (1+(12/4)/100)^4

If compounding is done k times a year (i.e.) once every 12/k months at the rate

of r% p.a. A few points to be remembered are listed below

1. In case of simple interest the principal remains the same every year. The interest for any year is the same as that for any other year.
2. In case of compound interest the amount at the end of a year is the principal for the next year. The interest for different years is not the same.

3. If the number of times of compounding in a year is increased to infinity we say compounding is done every moment and amount is given by P.e^nr/100

4. The difference between the compound interest and simple interest on a certain sum for 2 years is

equal to the interest calculated for one year on one year's simple interest.

5. The difference between the compound interest for k years and the compound interest for (k + 1) years is the interest for 1 year on the amount at the end of kth year.

6. The difference between the compound interest for the kth year and compound interest for (k + 1)th year is equal to the interest for one year on the compound interest for the kth year.

7. In Simple Interest loans, the repayments are adjusted against the principal, until the principal becomes zero. After the principal becomes zero, the payments received are adjusted against the interest, once the principal becomes zero; there is no further accumulation of interest.

8. In Compound Interest loans, the repayment money is adjusted against the principal of the compounding period during which repayment is made, until the principal becomes zero. After the principal becomes zero, the remaining money is adjusted against the interest due.

9. The specified rate of interest is called the nominal rate of interest. The effective rate of interest is that rate of simple interest which will result in an interest equal to that of the compound interest over the same period of time.

Important Tips to Crack Average Questions

Average can be defined as a single value that is meant to typify a data set. It gives a measure of the middle or expected value of the data set. Though there are many measures of central tendency, average typically refers to the arithmetic mean and is defined as the ratio of sum of items to the number of items in a dataset.

Average = Total value of all the items/Number

of items Change in averages

If the values of all the elements in a group are increased or decreased by a same value, the average of the group will also increase or decrease by the same value.

If the values of all the elements in a group are multiplied or divided by a same value, the average of the group will also get multiplied or divided by the same value.

Weighted average

An average that looks at the proportional relevance of each component, rather than treating each component equally is called a weighted average. A weighted average with all weights equal will turn into a simple average. A weighted average will still be between the largest and smallest values of the dataset irrespective of the weights attached to those data points.

For example, if the average height of group A is say 180 cm and average height of group B is say 170 cm, the average of the set comprising of both the groups might not be the simple average of these two values which is 175 cm. It will actually depend on the number of people in each of these groups which will act as a weight to the original average figures. Let us assume that there are 20 people in group A and 40 people in group B.

So, the weighted average = [(20x180) + (40x170)]/60 = 173.33 which will be the actual average of the new group.

A few points to be remembered are listed below

1. Given no other information, assume that all the numbers are at the same level as their average.

2. When a new number higher than the average is added to the group, then the average is bound to increase and vice versa. The increase in average will amount to

Difference between the new number and average/ [Original number of items + 1]

3. When a new number lesser than the average is added to the group, then the average is bound to decrease and vice versa. The decrease in average will amount to

Difference between average and the new number/ [Original number of items + 1]

4. When a number is replaced by a greater number average will increase and if it is replaced by a smaller number average will decrease. The increase or decrease in average can be calculated using the below formula.

Net increase in the sum (Diff. between new value & original value)/ Original number of items

Important Tips to Crack Progressions Questions

Arithmetic Progression:

An arithmetic progression is a sequence of numbers where the difference between any 2 consecutive terms is a constant. This constant value is called the common difference usually denoted by ‘d’.

If ‘a’ is the first term of the A.P and ‘d’ is the common difference then the terms of the A.P can be represented as a, a + d, a + 2d, a + 3d……

The nth term is usually represented by tn and the sum to n terms is

denoted by Sn tn = a + (n - 1)d

Sn = n2[2a + (n - 1)d]

= n2 [a + (a + (n - 1)d)]

= n2 [a + l]

where l denotes the last term of the A.P.

The average of all terms in an A.P is called their arithmetic mean.

Arithmetic Mean (A.M) = Sum of all the terms of the A.P/Number of terms in the A.P

= Sum of the first and the last terms/2

= Average of the first and the last terms.

The A.M is also equal to the average of any two numbers which are equidistant from either ends. For example, average of the second term and the penultimate term is also equal to the A.M. Sn can also be calculated from the A.M as follows:

Sn = A.M × n.

There are problems which involve three numbers which are in A.P. In such cases, the three numbers can be represented as (a - d), a, and (a + d) so that simplifications will be easier as terms get cancelled out. Similarly, four terms can be represented as (a - 3d), (a - d), (a +d), and (a + 3d) [here the common difference is 2d] and five terms can be represented as (a - 2d), (a - d), a, (a + d), and (a + 2d).

Geometric Progression:

A geometric progression is a sequence of numbers where the first term is non zero and each of its succeeding terms is obtained by multiplying a constant number with the previous term. The ratio of any number (other than the first) to the preceding one is a constant. This ratio is called the common ratio and usually denoted by 'r'.

If 'a' is the first term of the G.P and 'r' is the common ratio then the terms of the G.P can be represented as a, ar, ar2……

The nth term is usually represented by tn and the sum to n terms is

denoted by Sn tn = ar^ (n - 1) and

Sn = a [r^n- 1]/r - 1when r > 1

= a [1 – r^n]/1 - r when r < 1

= n × a when r = 1

When, | r | < 1, the sum of an infinite series converges to a finite value which is given as follows:

Sum of an infinite G.P a + ar + ar2 +…. = a1 - r where -1<r<1

The Geometric Mean (G.M) of two non-zero numbers a and b is given by √(ab)

If a1, a2,…an are n non-zero numbers then their Geometric Mean is given by (a1a2….an)/n

When there are three terms in a G.P, they can be represented as a/r, a and ar. Similarly when there are four terms they can be represented as a/r^3, a/r, ar and ar^3. Here the common ratio is r^2.

<u>A few points to be remembered are listed below</u>

1. Sum of first n natural numbers 1 + 2 + 3 +….+ n = n (n + 1)/2

2. Sum of the squares of the first n natural numbers 1^2 + 2^2 +...n^2 =1/6 n (n + 1)(2n + 1)

3. Sum of the cubes of the first n natural numbers 1^3 + 2^3 + 3^3 +…. + n^3 = [(n (n + 1))^2]/2

4. If three numbers a, b, c are in arithmetic progression, then the middle term 'b' will be the arithmetic mean of the three terms and is given by b = [a+c]/2

5. If a constant number is added (or subtracted) to each term of a given A.P, then the resulting sequence will also be an A.P, and it will have the same common difference as that of the original A.P.
Sum of the terms of the new series = Sum of the terms of the old series + n×constant (where n is the number of terms in the series).

6. If every term of an A.P. is multiplied by a non-zero constant (or divided by a non-zero fixed constant), then the resulting sequence is also an A.P.

Sum of the terms of the new series = constant × sum of the terms of the old series

7. If every term of a G.P. is multiplied by a non-zero constant (or divided by a non-zero fixed constant), then the resulting sequence is also a G.P. with the same common ratio.

8. The product of two different geometric progressions is also a geometric progression with the common ratio equal to the product of the common ratios of the two original progressions.

9. For any set of numbers, the arithmetic mean is always greater than or equal to geometric mean which is always greater than or equal to the harmonic mean.

AM >= GM >= HM

Important Tips to Crack Time Speed and Distance Questions

Time and distance as a topic involves a variety of areas which include speed-time-distance concepts, relative speed, moving and stationary bodies, boats and streams, circular motion, and so on. While the diversity of problems from this area is vast, the concepts are not many and once grasped, will enable you to solve many of the problems with ease. A familiarity with the types of problems will also help.

TYPES OF PROBLEMS

The following table gives the various types of problems and the approach used for each one. A word of caution here: while it is a good idea to have some approaches in hand while attempting problems, it is very important to analyse each problem on its own merit and then decide the exact approach required. Blindly following the approaches given below could result in wrong answers.

Type of problem	**Approach**
Approaching or receding bodies – two trains approach each other and pass by, what is the time taken for passing?	Use concept of relative speed and the basic idea of "speed = distance/ time" to form an equation that can be solved for time
Boat traveling with or against the current – what is the effective speed, or what is the time required to reach a particular point up/downstream?	Use the concept of boats and streams to form suitable equations that can be solved for the required unknown
Races along a straight track – how much start should the faster runner give the slower one so that they both finish together?	Decide which quantity (distance or time) is the same for both runner and equate its formula on both sides, then solve for the unknown
Races along a circular track – when is the first meeting, when is the first meeting at the starting point?	Understand the problem thoroughly and decide which of the formulas to apply
Other problems on time and distance	Understand the problem thoroughly, express the given data in equations as far as possible, and decide which of the basic formulae to apply

Units of speed and conversion factors

The units of speed are kilometre per hour (kmph or km/h) and metre per second (m/s). To convert a speed given in m/s into a speed in km/h, multiply with 18/5.

To convert a speed given in km/h into a speed in m/s, multiply with 5/18.

A simple way to remember the multiplying factor is to recall that a particular speed when expressed in km/h is numerically larger than the same speed expressed in m/s.

For other units like m/min or km/min, it is sufficient to remember that 1 km = 1000m and 1 min = 60 sec.

PASSING, CROSSING AND OVERTAKING BODIES

Problems may often feature bodies that move while other bodies may move or remain stationary. In such cases, the following points are to be noted.

- Objects like man, car, cycle, telegraph pole and tree are to be taken as point objects, with negligible length. When a train of length ‘l’ passes such an object, the distance covered while passing is equal to the length of the train ‘l’.
- Objects like train, platform and bridge have length which needs to be taken into account when approaching the problem. When a train passes such an object of length ‘p’, the distance covered while passing is equal to the total length of the train and the object, i.e., ‘l+p’. This holds true even when the second object is another train.
- When two bodies pass each other (one body may be stationary), the speed of passing is equal to the relative speed between the two bodies.

Formulae related to passing, crossing and overtaking bodies

The basic formula to be applied remains the same, i.e., d = s × t. Care should be taken to substitute the correct value of‘d’ as mentioned in the above points. Also,’s’ should be replaced by the relative speed.

Travel and meeting

When two persons start from two points at the same time and travel towards each other, the time taken by each of them to reach the meeting point is the same. Hence, the distances covered by them from their respective starting points to the meeting point will be proportional to their respective speeds.

D1/D2 = S1/S2

Important Tips to Crack Permutations and Combinations Questions

Permutations and Combinations is considered by some students as one of the toughest topics primarily because each problem that they encounter is different, requires application of one’s reasoning skills and doesn’t fit into a small framework of generalizations and formulae, like other topics in mathematics. Also, the concepts covered in this particular topic is widely used to solve problems in another important topic namely probability. Students can definitely expect a couple of questions from this topic in TCS Ninja National Qualifier Test.

Fundamental rule of counting

The entire science of permutations & combinations is based on the fundamental principle of counting and hence it is very important that we understand the principle thoroughly before proceeding to define permutations and combinations.

Let us take the example of tossing a coin thrice. Each toss results in one of two possible outcomes: heads or tails. For each possible outcome of the first toss, there are two possible outcomes of the second toss. So after the second toss, there are in all four possible outcomes (2×2=4). For each of the four possible outcomes of the first and second tosses, there are two possible outcomes of the third toss. So after the third toss, there are in all eight possible outcomes (2×2×2=8).

Fundamental rule of counting generalizes the special case we just saw with the help of the above example. If an event or a trial has ‘m’ outcomes and for every outcome of the previous event, a second event has ‘n’ outcomes, then the number of different ways by which both events can be conducted will be the product of m and n.

Hence, the number of ways in which two operations can be performed together = mxn. This is a very important principle which forms the foundation for permutations and combinations.

Permutations means selection and arrangements nPr = n!

/ (n-r)! Combinations means just selection nCr = n! / r! (n-

r)!

Linear arrangement of n items will be n!

ways Circular arrangement of n items will be

(n-1)! Ways

Important Tips to Crack Probability Questions

Probability is a topic of significance in most of the management exams primarily because probability theory plays a major role in all scientific disciplines including management. Most of the problems in probability will need a thorough understanding and knowledge in the theories of counting, permutations and combinations. The word probability does not have a direct definition but it can be defined as a measure of how likelihood for the occurrence of some event. In many contexts, the word probability is used synonymously with chance.

BASIC DEFINITIONS

Following definitions are fairly critical in order to obtain complete understanding in the subject of probability.

Deterministic experiment: If the outcome of an experiment is certain, then it is called a deterministic experiment.

Random experiment: If the outcome of an experiment is not unique and can be one amongst many possible outcomes, then it is called a random experiment.

Sample space: The set of all possible outcomes of an experiment is called sample space.

Event: Any subset of the sample space is called an event. It comprises of one or more outcomes of the experiment.

Biased experiment: If the likelihood of occurrence of one outcome is more than other outcomes, then the experiment is biased.
Unbiased experiment: If all the outcomes of the experiment are equally likely to happen, then the experiment is called an unbiased experiment.

Mutually exclusive events: Two events are said to be mutually exclusive if the occurrence of one event eliminates the possibility of the occurrence of another. A good example would be when a coin is tossed once, the occurrence of a heads and tails are mutually exclusive as both of them cannot happen simultaneously.

Collectively exhaustive events: Events that together cover all possible outcomes are called collectively exhaustive events. For example, when a die is thrown, getting an odd number and getting an even number are two events which put together will account for all possible outcomes. These events are called collectively exhaustive.

Independent events: Two events are said to be independent, if the occurrence of one event does not affect the occurrence of another.

DEFINITION OF PROBABILITY

If an experiment has 'n' outcomes in total, out of which 'm' outcomes are in favour of one particular event, then the probability of that event is the ratio of m to n. Probability of an event E is denoted by P (E).

P(E) = m/n

Other important points to be noted

1) Sum of probabilities of all outcomes of an experiment is 1.

2) If the events are mutually exclusive and collectively exhaustive, then the sum of probabilities of the events will be equal to 1.

3) Probability of an event happening P(E) is called probability of success and the probability of the event not happening P(E) is called probability of failure.

4) If the probability of an event happening P(E) is equal to m/n, then we can also say that the odds in favour of the event is m to n-m and odds against the event is n - m to m.

5) Unless specified otherwise, consider the given experiment as an

unbiased one. TCS Ninja Questions based on typical experiments

Let us now look at some typical experiments which are asked frequently in most management entrance exams.

Throwing dice: A die has 6 faces and when we say a die shows up a number we are referring to the number on the face which is facing the upward direction. Hence, there are 6 likely outcomes when a single die is thrown. When more than one die is thrown simultaneously, then the number of likely outcomes will be 6n where n is the number of dice thrown. This can be easily ascertained as follows. The number of outcomes of the first die is 6 and for each outcome of the first die, there will be 6 possible outcomes from the second die. Therefore, by the fundamental principle of counting, the total number of possibilities is 6 x 6 when two dice are thrown. This can be extended to arrive at the above formula.

Tossing coins: Tossing coins is very similar to throwing dice except for the fact that a coin has only two possible outcomes. Hence, if n is the number of tosses, then the number of possible outcomes will be 2^n.

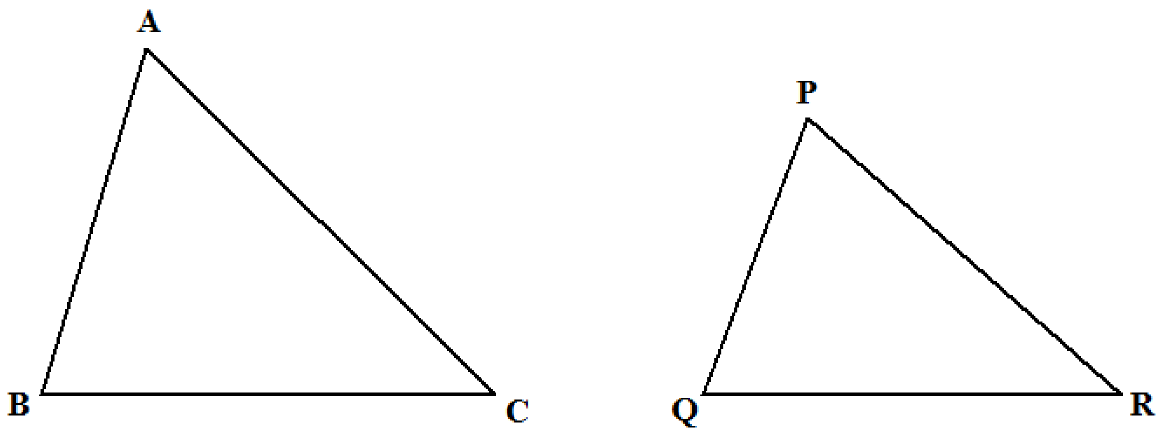
Pack of cards: Questions based on pack of cards are the most often asked questions in CAT and it is essential that one knows the details in order to solve such problems. A standard pack of cards has 52 cards in total. There are 4 different suits namely hearts, clubs, spades and diamonds. Each suit has 13 cards numbered from 2-10, Jack, Queen, King and Ace. There are in total 26 red cards - Hearts and diamonds and 26 black cards - clubs and spades. With these details, we can solve the problems based on various experiments using the pack of cards.

Important Tips to Crack Similar and Congruent Triangles Questions

Congruent and similar triangles

Similar triangles

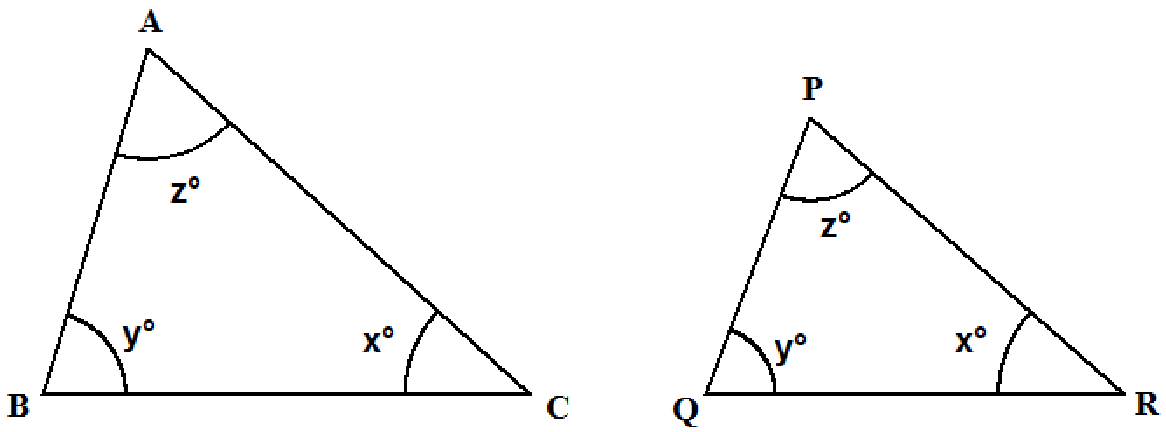
Two triangles are said to be similar, if their corresponding angles are equal and corresponding sides are proportional. In other words, similar triangles have exactly the same shape, but not necessarily the same size.



There are three axioms or postulates which are helpful in determining if the given triangles are similar provided at least three quantities are known (except for AA postulate). The three postulates are stated as follows:

<u>AAA Postulate</u> (also called AA postulate)

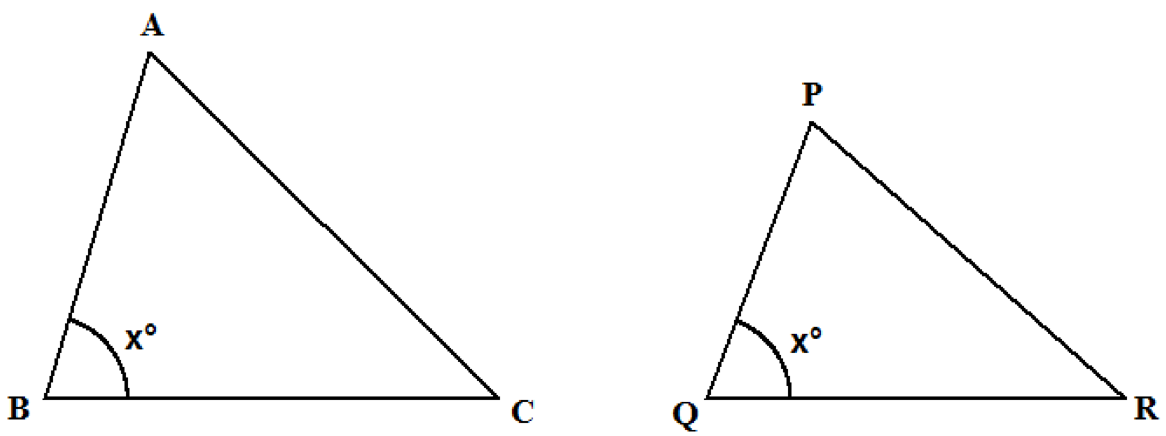
If all the three angles of one triangle are equal to the corresponding angles of another triangle, then the two triangles are said to be similar.



Note: If two corresponding angles are equal for the given triangles, then the third angle should necessarily be equal in order to satisfy the rule "Sum of angles of a triangle is equal to 180o."

<u>SAS Postulate</u>

If two sides of one triangle are proportional to two corresponding sides of the other triangle and the included angles are equal, they are said to be similar.

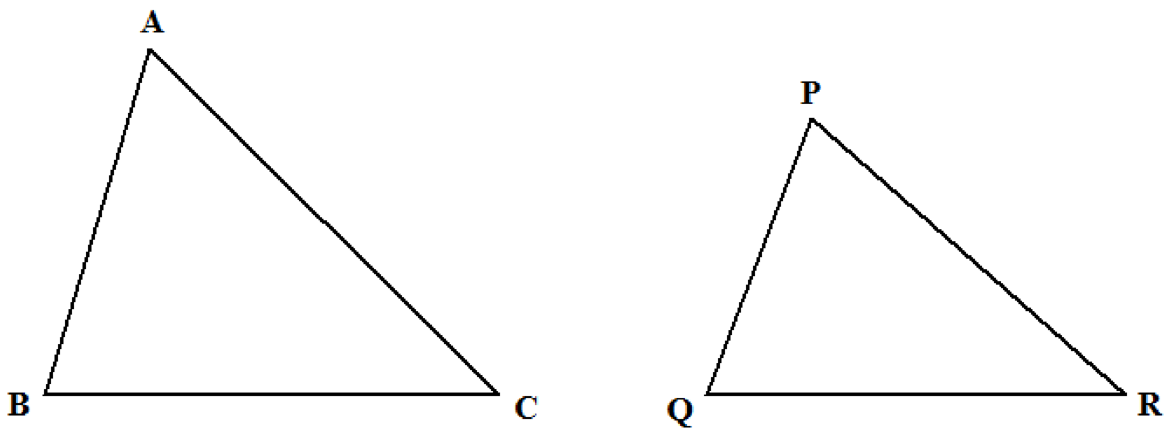


Here, AB/PQ = BC/QR

Therefore, the triangles ABC and PQR are

similar. SSS Postulate

If three sides of one triangle are proportional to the corresponding sides of the other, then they are said to be similar.



Here,

AB/PQ = BC/QR = AC/PR

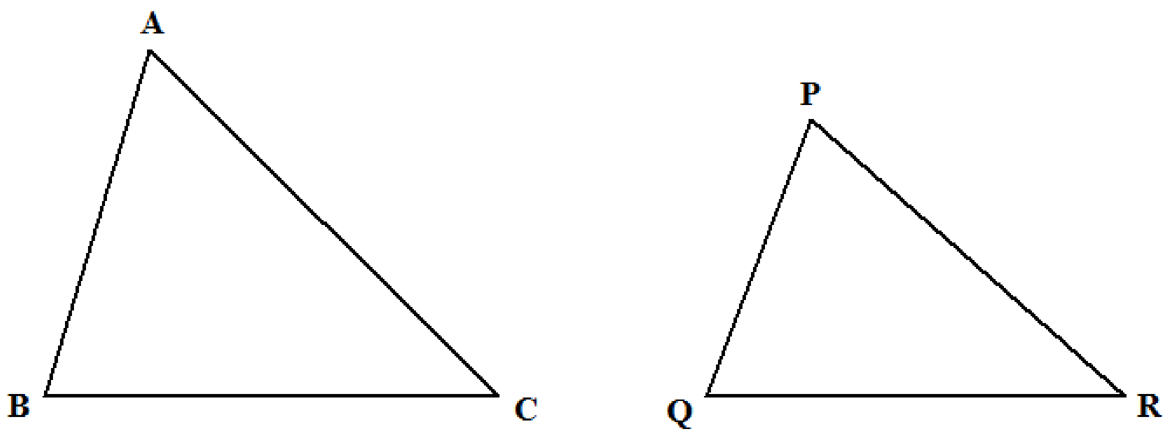
Therefore, the triangles ABC and PQR are

similar. Some properties of similar

triangles

In two similar triangles, ratio of corresponding sides = ratio of corresponding heights = ratio of the lengths of corresponding medians = ratio of the lengths of the corresponding angular bisectors = ratio of inradii = ratio of circumradii = ratio of perimeters.

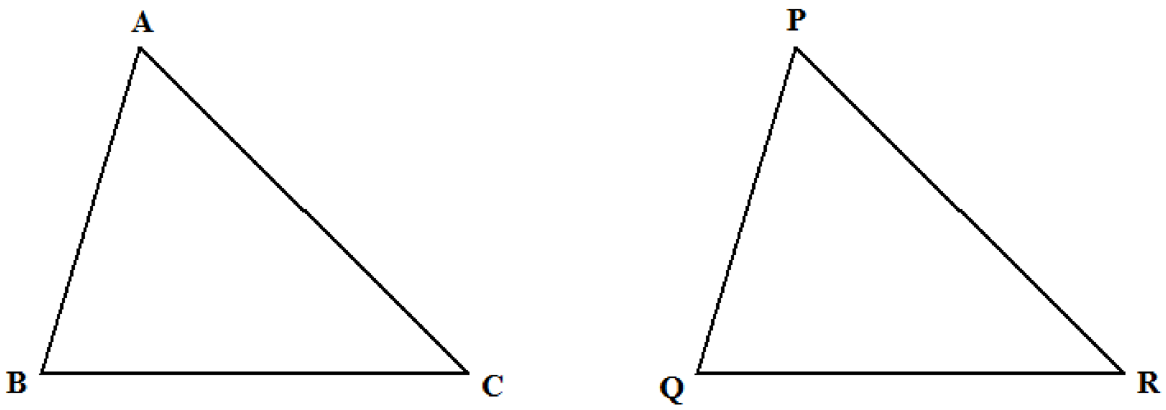
Ratio of areas is equal to the ratio of squares of corresponding sides in two similar triangles.



Area of ABC/Area of PQR = [AB/PQ]^2 = [BC/QR]^2 =

[AC/PR]^2 Congruent triangles

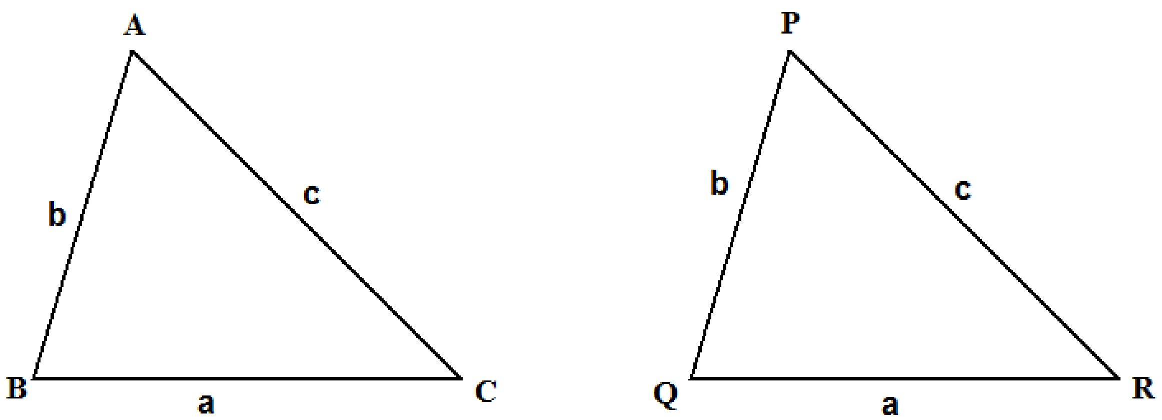
Two triangles are said to be congruent if their corresponding angles and corresponding sides are equal. Two congruent triangles can be considered equal in all respects including the sides, angles, lengths of medians, lengths of angular bisectors, circumradii, inradii, altitudes, perimeter and area.



There are three axioms or postulates which are helpful in determining if the given triangles are congruent provided at least three quantities are known. These axioms are stated as follows:

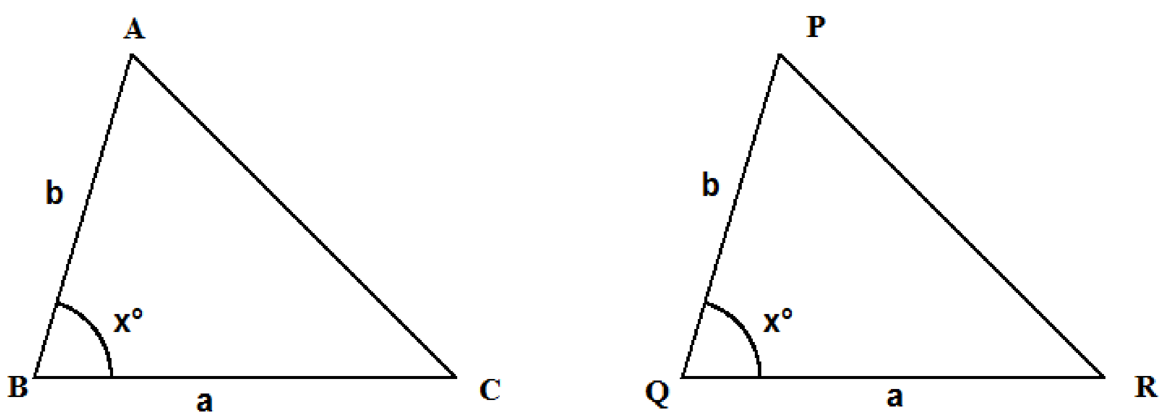
SSS Postulate

If all the three sides of one triangle are equal to the corresponding sides of another triangle, then the two triangles are said to be congruent.



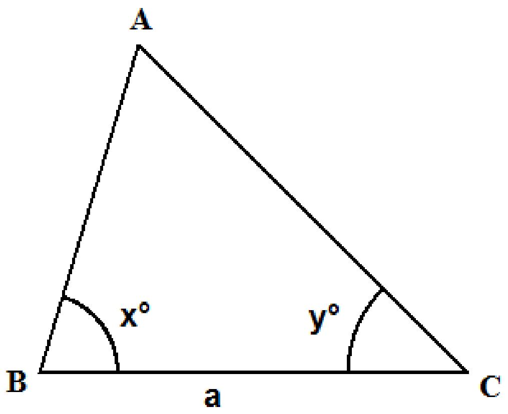
SAS Postulate

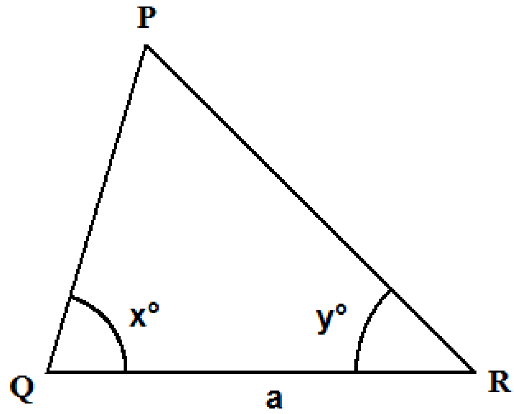
If two sides of one triangle are equal to two corresponding sides of the other and the included angles are equal, they are said to be congruent.



ASA Postulate

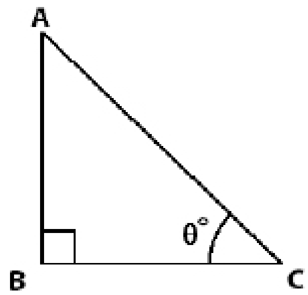
If two angles and a side of one triangle are equal to the corresponding angles and side of the other, then they are said to be congruent.





<u>Important Tips to Crack Trignometry Questions in TCS Ninja</u>

Trigonometry uses the fact that ratios of pairs of sides of triangles are functions of the angles. The basis for mensuration of triangles is the right-angled triangle. The term trigonometry means literally the measurement of trigons (triangles). This mensuration approach defines the six trigonometric ratios in terms of ratios of lengths of sides of a right triangle.



$$\sin\theta = \frac{\text{opp}}{\text{hyp}} = \frac{AB}{AC} \qquad \operatorname{cosec}\theta = \frac{\text{hyp}}{\text{opp}} = \frac{AC}{AB}$$

$$\cos\theta = \frac{\text{adj}}{\text{hyp}} = \frac{BC}{AC} \qquad \sec\theta = \frac{\text{hyp}}{\text{adj}} = \frac{AC}{BC}$$

$$\tan\theta = \frac{\text{opp}}{\text{adj}} = \frac{AB}{BC} \qquad \cot\theta = \frac{\text{adj}}{\text{opp}} = \frac{BC}{AB}$$

From the ratios, we can easily observe the following relations.

$$\sin\theta = \frac{1}{\operatorname{cosec}\theta} \qquad \operatorname{cosec}\theta = \frac{1}{\sin\theta}$$

$$\cos\theta = \frac{1}{\sec\theta} \qquad \sec\theta = \frac{1}{\cos\theta}$$

$$\tan\theta = \frac{1}{\cot\theta} \qquad \cot\theta = \frac{1}{\tan\theta}$$

$$\tan\theta = \frac{\sin\theta}{\cos\theta} \qquad \cot\theta = \frac{\cos\theta}{\sin\theta}$$

Other standard results

i. $\sin^2\theta + \cos^2\theta = 1$

ii. $\operatorname{cosec}^2\theta - \cot^2\theta = 1$

iii. $\sin 2\theta = 2\sin\theta\cos\theta$

iv. $\cos 2\theta = 2\cos^2\theta - 1 = 1 - 2\sin^2\theta$

$= \cos^2\theta - \sin^2\theta$

In a triangle, if A, B, C are the angles opposite to the sides of the triangle a, b, c respectively and if R is the circumradius of the triangle, then

v. $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} = 2R$

vi. $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$

vii. $\cos B = \frac{a^2 + c^2 - b^2}{2ac}$

viii. $\cos C = \frac{a^2 + b^2 - c^2}{2ab}$

ix. $\sin(A + B) = \sin A \cos B + \cos A \sin B$

x. $\sin(A - B) = \sin A \cos B - \cos A \sin B$

xi. $\cos(A + B) = \cos A \cos B - \sin A \sin B$

xii. $\cos(A - B) = \cos A \cos B + \sin A \sin B$

xiii. $\tan(A + B) = (\tan A + \tan B) / (1 - \tan A \tan B)$

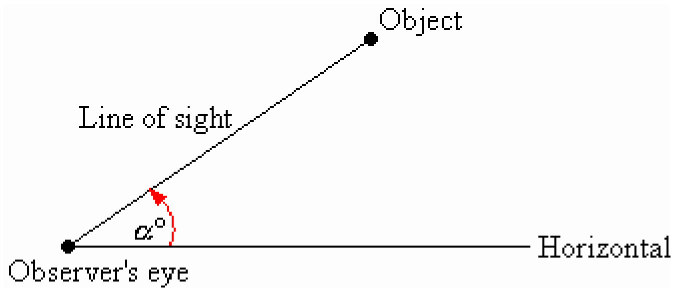
xiv. $\tan(A - B) = (\tan A - \tan B) / (1 + \tan A \tan B)$

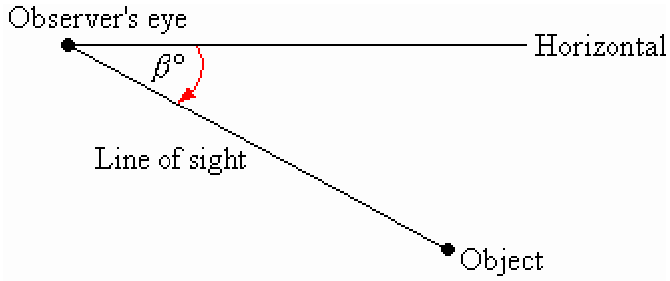
xv. $\sin 2A = 2 \sin A \cos A = 2 \tan A / (1 + \tan 2A)$

xvi. $\cos 2A = \cos^2 A - \sin^2 A = (1 - \tan^2 A) / (1 + \tan^2 A) = 1 - 2\sin^2 A = 2\cos^2 A - 1$

<u>Solving right angled triangles</u>

One of the most important applications of trigonometric functions is to solve a right triangle. Trigonometric functions can be used to solve a right triangle if either the length of one side and the measure of one acute angle is known or the length of two sides is known. The angle between the line of sight and horizontal is called the angle of elevation if the object of observation is at a higher level than the eye.





The angle between the line of sight and horizontal is called the angle of depression if the object of observation is at a lower level than the eye.