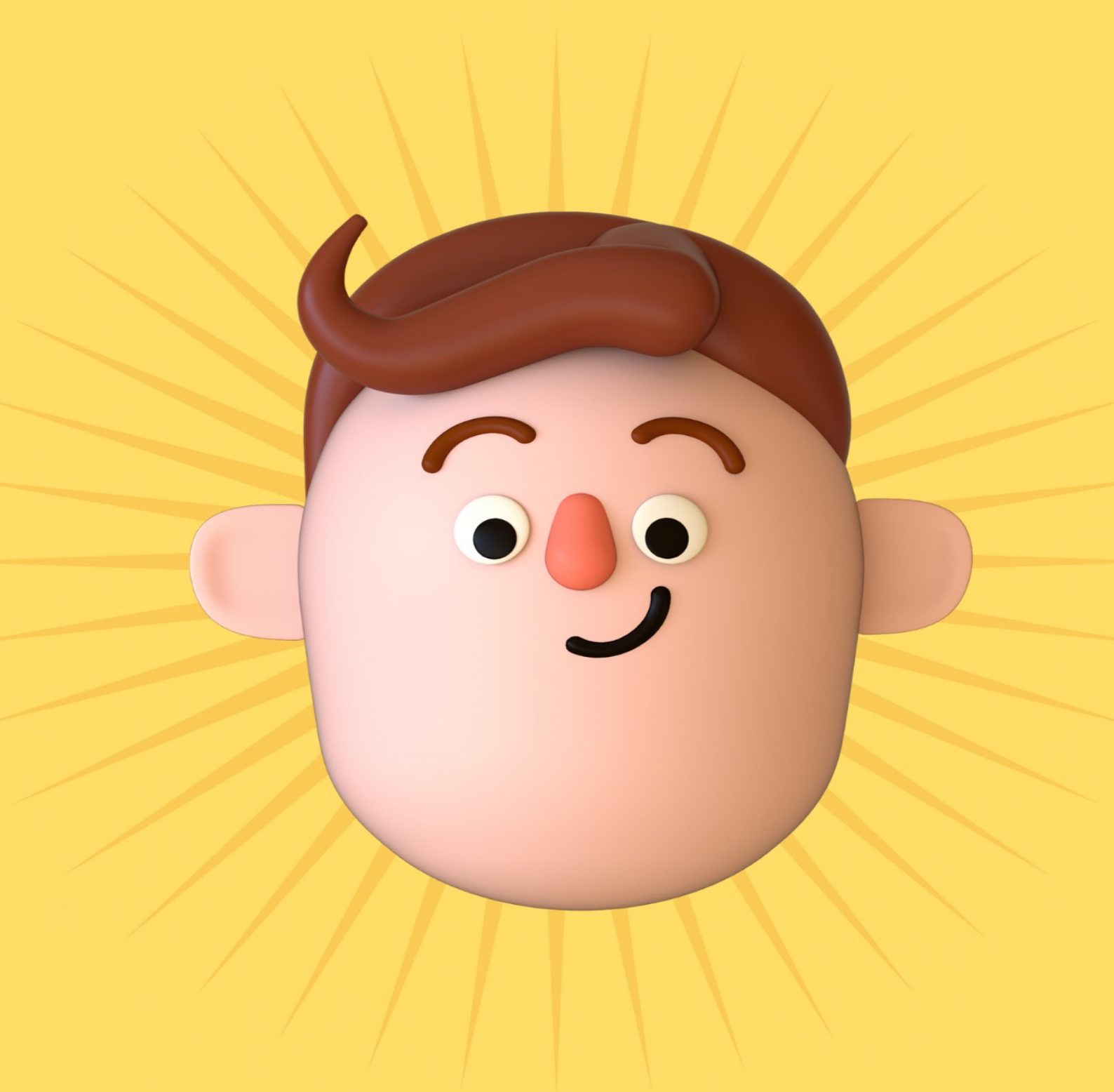


CLASS 10 MATHS

PREVIOUS YEAR CHAPTERWISE/TOPICWISE ANALYSIS

SHOBHIT NIRWAN

Real Numbers

[A] Terminating / Non-Terminating (2^n5^m type)
⇓
2009, 2010, 2017

[B] Find HCF
⇓
2017, 2018

[C] HCF, LCM formula
⇓
2010, 2018, 2020

[D] Prove Irrational
⇓
2009, 2010, 2010

Questions

[A]

Q. Write whether the rational number 7/75 will have a terminating decimal expansion or a non-terminating repeating decimal expansion. **(CBSE 2017-1M)**

The rational number $\frac{7}{75}$

The denominator = $75 = 3 \times 25 = 3 \times 5^2 \times 2^0$

Hence the denominator cannot be written in form $2^m \cdot 5^n$. So it is non-terminating repeating decimal expansio

Q. Has the rational 441/22x55x72 a terminating or non terminating decimal expansion? **(CBSE 2010-1M)**

Q. Has the rational number 51/1500 a terminating or non terminating decimal expansion? **(CBSE 2009-1M)**

[B]

Q. What is the HCF of the smallest prime number and the smallest composite number? **(CBSE 2018-1M)**

Smallest prime number is 2 and smallest composite number is 4.

Clearly, 2 is a factor of 4, so their H.C.F. is 2.

Thus, the H.C.F. of the smallest prime number and the smallest composite number is 2.

Q. If two positive integers p and q are written as $p=a^2b^3$ and $q=a^3b$; a, b are prime numbers, then verify: LCM (p, q) × HCF (p, q) = pq. **(CBSE 2017-2M)**

[C]

Q. Find HCF and LCM of 404 and 96 and verify that HCF× LCM = Product of the two given numbers. **(CBSE 2018-3M)**

Expressing the number as a product of prime number

$404 = 2 \times 2 \times 101$

$96 = 2 \times 2 \times 2 \times 2 \times 2 \times 3$

$\therefore$ LCM of 404 and 96 is $2 \times 2 \times 2 \times 2 \times 2 \times 101 \times 3 = 9696$

$\therefore$ HCF of 404 and 96 is $2 \times 2 = 4$

Now $\mathrm{HCF} \times \mathrm{LCM} = 4 \times 9696 = 38784$

Product of two given numbers $404 \times 96 = 38784$

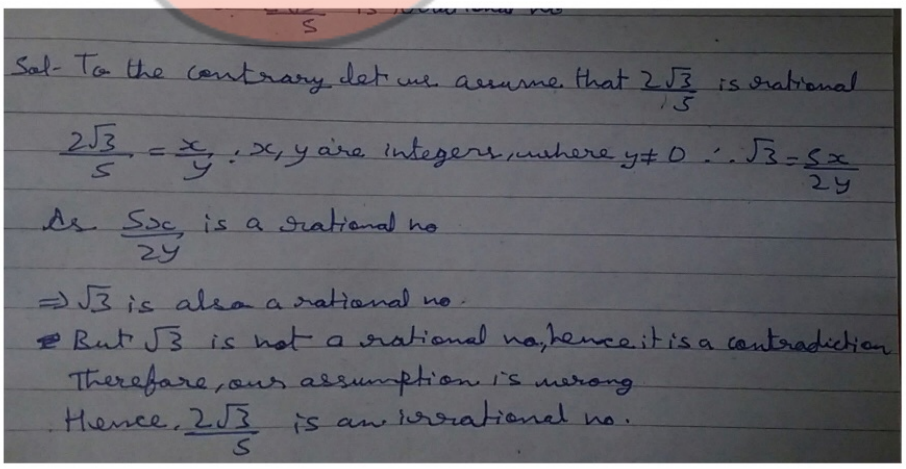
Hence $\mathrm{HCM} \times \mathrm{LCM}$ = product of two given numbers.

Q. Find HCF and LCM of 306 and 54 and verify that HCF× LCM = Product of the two given numbers. **(CBSE 2010-3M)**

Q.The HCF and the LCM of 12, 21, 15 respectively are?

[D]

Q. Prove that $2\sqrt{3}/5$ is an irrational number. **(CBSE 2010-3M)**



Q. Prove that $7 + 3\sqrt{2}$ is not a rational number. **(CBSE 2009-3M)**

Q. Prove that $2 - 3\sqrt{5}$ is an irrational number. **(CBSE 2010-3M)**

[Others]

Q. Identify the rational number : $5 - \sqrt{3}$, $5 + \sqrt{3}$, $4 + \sqrt{2}$, $5 + \sqrt{9}$. **(CBSE 2010-1M)**

Ans - We know that If q is Rational and s is irrational then q+s , q-s,qs and q/s (s≠0) are irrational .

Here ,

i) q = 5, s = √3

5-√3 is irrational

ii) q = 5 , s = √3

5+√3 is irrational,

iii) q = 4, s = √2,.

4+√2 is irrational

iv) q = 5 (rational)

√9 = 3 (rational)

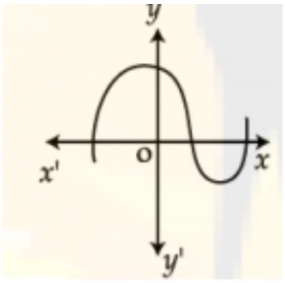
Therefore,.

5-√9 = 5-3 = 2 (Rational)

Polynomials

In the last 10 years, only 5 questions were asked from this chapter. (The questions which are not in latest syllabus of 2020-21 are not included for your convenience :)

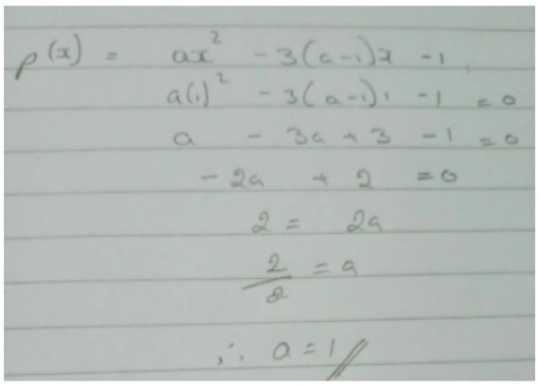
Questions



1. Find the number of zeroes of the polynomial given in the graph. **(CBSE 2010-1M)**
2. If 1 is zero of polynomial $p(x)=ax^2-3(a-1)x-1$ then find the value of a. **(CBSE 2010-1M)**
3. If α and β are zeroes of a polynomial such that α+ β=6 & αβ=6, then write a polynomial. **(CBSE 2010-1M)**
4. Write the polynomial, the product and sum of whose zeroes are $-\frac{9}{2}$ and $-\frac{3}{2}$ respectively. **(CBSE 2009-1M)**
5. Find the zeroes of the quadratic polynomial $\sqrt{3}x^2-8x+4\sqrt{3}$. **(CBSE 2010-2M)**

Ans 1 : The zeros of the polynomial are the points where the graph intersects the x-axis. In the given graph, the curve intersects the x-axis at four points, therefore, the number of zeros of the polynomial are 3.

Ans 2 :



Ans 3 : to get this quadratic equation in polynomial form , it can be written as

α + β = 6 , α β = 4

x^2 - (α + β) x + αβ = 0

x^2 - 6 x + 4 = 0

Ans 4 : Sum of zeroes = -9/2
Product of zeroes = -3/2
The required polynomial is :-
$k [x^2 - (\text{sum of zeroes})x + (\text{product of zeroes})]$
$k [x^2 - (-9/2)x + (-3/2)]$
$k [x^2+9x/2 - 3/2]$
put k=2 to remove the fraction
$2(x^2+9x/2 - 3/2)$
$2x^2+9x-3$ is required polynomial

Ans 5 : Given quadratic equation = $\sqrt{3}x^2 - 8x + 4\sqrt{3} = 0$
We should factorize the equation first.
$= \sqrt{3}x^2-6x-2x+4\sqrt{3} = 0$
$= \sqrt{3}x(x-2\sqrt{3})-2(x-2\sqrt{3}) = 0$
$= (\sqrt{3}x-2)(x-2\sqrt{3}) = 0$
$= (\sqrt{3}x-2) = 0 , (x-2\sqrt{3}) = 0$
$= x = 2/\sqrt{3} , x = 2\sqrt{3}.$

Linear Equations in 2 Variables

[A] Checking for types of solution of pair of linear equations in 2 var.
⇓
2009, 2010, 2010, 2010, 2017, 2018, 2020

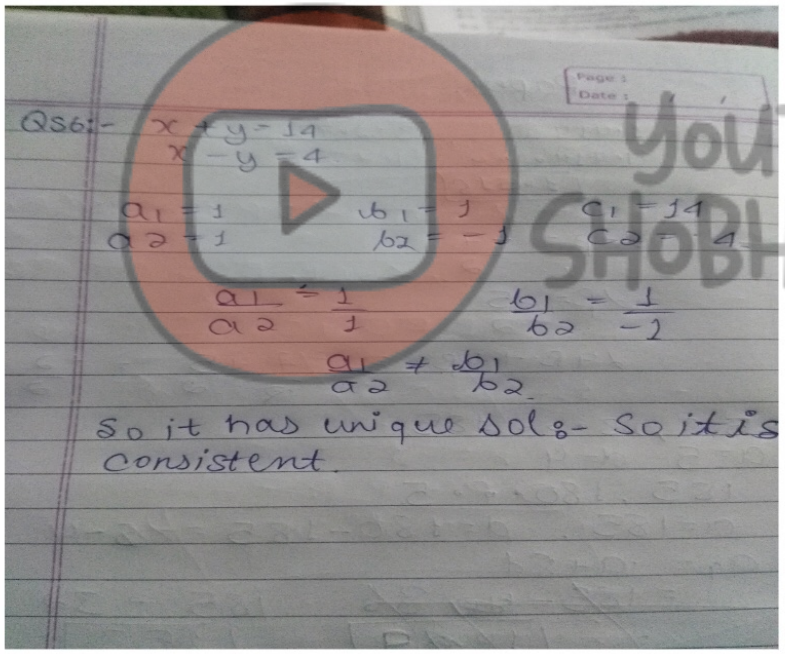
[B] Word Problem
⇓
2010, 2017, 2018

[C] Equations Reducible to Pair of Linear Equations in 2 var.
⇓
2010, 2010

Questions

[A]

Q. Write whether the following pair of linear equations is consistent or not: x+y=14 & x-y=4.



Q. Find the value(s) of k for which the pair of linear equations $kx + y = k^2$ and $x + ky = 1$ have infinitely many solutions. **(CBSE 2017-2M)**

Q. Find the value of p for which the following equations have a unique solution. 4x+py+8=0, 2x+2y+2=0 **(CBSE 2010-2M)**

Q. Find the value(s) of k for which the pair of linear equations 2x +3y = 7 and (k-1)x + (k+2)y = 3k have infinitely many solutions. **(CBSE 2010-2M)**

Q. Without drawing the graph, find out whether the lines representing the following pair of linear equations intersect at a point, are parallel or coincident: 9x-10y=21 & 3/2x-5/3y=7/2 . **(CBSE 2009-2M)**

Q. For what values of a and b the following equations have infinite solutions. 2x+3y=7; a(x+y)-b(x-y)=3a+b-2 **(CBSE 2010-3M)**

Q. Solve the system of equations graphically. Also, find the points where the lines meet the x-axis. x+2y=5; 2x-3y=-4 **(CBSE 2010-4M)**

Q. The value of k for which the system of equations x+y-4 = 0 and 2x + ky=3 has no solution. **CBSE 2020-1M**

[B]

Q. In Fig. 1, ABCD is a rectangle. Find the values of x and y. **(CBSE 2018-2M)**

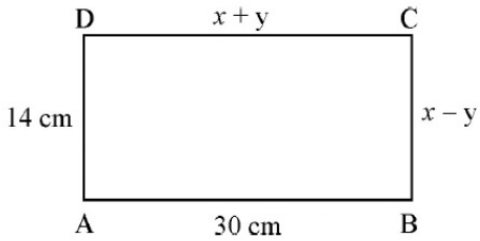


Fig. – 1

Ans: x+y = 30

x-y = 14

Solve these both equations and you'll get x & y.

Q. Seven times a two digit number is equal to four times the number obtained by reversing the order of its digits. If the difference of the digits is 3, determine the number. **(CBSE 2017-3M)**

Ans - let numbers be x at ones place and y at tens place so

10y+x is that digit

now reversed digit is 10x+y

according to question

7 (10y+x)=4(10x+y)

x=2y (i)

now

given

x-y=3

from eq. i 2y=x

2y-y=3

y=3

so

x=63

required original no. is 36 and reversed digit is 63

Q. The sum of numerator and denominator of a fraction is three less than twice the denominator. If each denominator and denominator is decreased by 1, the fraction becomes ½ . Find the fraction. **(CBSE 2010-3M)**

[C]

Solve for x and y: $\frac{5}{x-1}+\frac{1}{y-2}=2$ & $\frac{6}{x-1}-\frac{3}{y-2}=1$ **(CBSE 2010-3M)**

Solve for x and y: $\frac{4}{x}+3y=8$ & $\frac{6}{x}-4y=-5$ **(CBSE 2010-3M)**

Ans 1 : Solving them by reducing them to pair of linear equations:

First equation:

$$\frac{5}{x-1}+\frac{1}{y-2}=2$$

or, $\frac{5(y-2)+x-1}{(x-1)(y-2)}=2$

$$\frac{5y-10+x-1}{xy-2x-y+2}=2$$

$= x+5y-11=2xy-4x-2y+4$

or ,$x+5y-11+4x+2y-4=2xy$

or, $5x+7y-15=2xy$

second equation:

$$\frac{6}{x-1}-\frac{3}{y-2}=1$$

$$\frac{6y-12-3x+3}{xy-2x-y+2}=1$$

$= 6y-3x-9=xy-2x-y+2$

$6y-3x-9+2x+y-2=xy$

or, $7y-x-11=xy$

Multiply the second equation by 2 and subtract first equation from resultant

$14y-2x-22=2xy$

$7y+5x-15=2xy$

$7y-7x-7=0$

$y-x-1=0$

$y=x+1$

Substituting the value of x in first equation, we get;

$5x+7y-15=2xy$

Or, $5x+7x+7-15-2x(x+1)$ Or, $12x-8=2x^2+2x$ Or, $10x-8=2x^2$ Or, $x^2=5x-4$

Similarly, substituting the value of y in second equation, we get;

$7y-x-11=xy$

Or, $7x+7-x-11=x^2+1$ Or, $6x-5=x^2$

From above two equations, it is clear

$5x-4=6x-5$

Or, $5x+1=6x$

Or, $x=1$

Hence, $y=x+1=2$

Hence, $x=1$ and $y=2$

Quadratic Equation

[A] Simple value putting
2017, 2017, 2018, 2020

[B] Quadratic formula
2010, 2010, 2017, 2017, 2017, 2017, 2017
diff. sets

[C] Discriminant
2009, 2010, 2010, 2017, 2017, 2019

[D] Word Problem
2017, 2017, 2018, 2009, 2010, 2010

[E] LCM
2010, 2010, 2017, 2017

[F] Upstream & Downstream
2010, 2017, 2018

Questions

[A]

Q. If one of the zeroes of the quadratic polynomial x^2 + 3x + k is 2, then the value of k ? **CBSE 2020-1M**

Q. If x = 3 is one root of the quadratic equation $x^2 - 2kx - 6 = 0$, then find the value of k. **(CBSE 2018-1M)**

Ans - Given it's one root of the equation $x^2 - 2kx - 6 = 0$
one of its root x = 3
for finding the value of k put the value of x in this equation.
$(3)^2 - 2k(3) - 6 = 0$
$9 - 6k - 6 = 0$
$6k = 3$
$k = 3/6$
$k = 1/2$
hence,the value of k = ½

Q. If one root of the quadratic equation 6x^2-x-k=0, then find the value of k. **(CBSE 2017-1M)**

Q. Find the values of k, if the quadratic 3x^2-√3kx+4=0 has equal roots.**(CBSE 2017-1M)**

Q. For what values of k, the roots of the equation x^2+4x+k=0 are real? **CBSE 2020**

[B]

Q. Find the roots of the equation x^2+x-p(p+1)=0, where p is a constant. **(CBSE 2010-1M)**

Q. Find the value of p, for which one root of the quadratic equation px^2-14x + 8 = 0 is 6 times the other. **(CBSE 2017-2M)**

Q. Find the roots of √2x^2 + 7x + 5√2=0 **(CBSE 2017-2M)**

Q. Solve for x : √3x^2+10x-8√3=0. **(CBSE 2017-2M)**

Q. Solve for x : √2x^2+7x+5√2=0 . **(CBSE 2017-3M)**

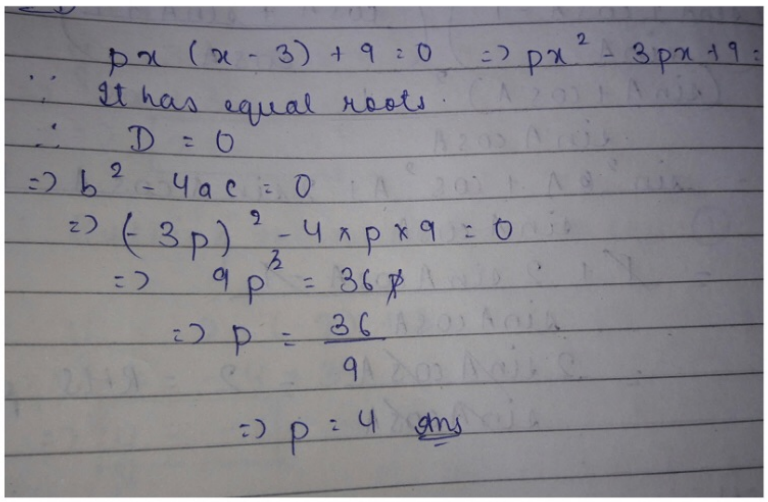
Q. Find the roots of the √3x^2-2√2x-2√3=0 **(CBSE 2010-3M)**

Q. If the roots of the quadratic equation (a – b) x^2 + (b – c) x + (c – a) = 0 are equal, prove that 2a = b + c. **(CBSE 2017-3M)**

[C]

Q. Write the nature of roots of quadratic equation $4x^2+4\sqrt{3}x+3=0$. **(CBSE 2009-1M)**

Q. Find the value of p so that the quadratic equation px(x-3)+9 = 0 has two equal roots. **(CBSE 2010-2M)**



Q. Find the value of k for which the roots of the quadratic equation $2x^2 + kx + 8 = 0$ will have equal value. **(CBSE 2017-2M)**

Q. Find the value of *k* for which the equation $x^2 + k(2x+k-1)+2 = 0$ has real and equal roots. **(CBSE 2017-2M)**

Q. Find the value of *k* for which the equation $(k-5)x^2 + 2(k-5)x+2 = 0$ has real and equal roots. **(CBSE 2010-2M)**

Q. If $ad \neq bc$, then prove that the equation $(a^2 + b^2)x^2 + 2(ac + bd)x + (c^2 + d^2) = 0$ has no real roots. **(CBSE 2017-3M)**

Q. If the equation $(1+m^2)x + 2mcx+c^2-a^2 = 0$ has equal roots then show that $c^2 = a^2(1+m^2)$. **(CBSE 2017-3M)**

Q. Find the values of k, if the quadratic $3x^2-\sqrt{3}kx+4=0$ has equal roots.**(CBSE 2017-1M)**

Q. For what values of k, the roots of the equation $x^2+4x+k=0$ are real? **CBSE 2019**

[D]

Q. A plane left 30 minutes late than its scheduled time and in order to reach the destination 1500 km away in time, it had to increase its speed by 100 km/h from the usual speed. Find its usual speed. **(CBSE 2018-3M)**

Q. A train travels at a certain average speed for a distance of 63 km and then travels at a distance of 72 km at an average speed of 6 km/hr more than its original speed. If it takes 3 hours to complete a total journey, what is the original average speed ? **(CBSE 2018-4M)**

Q. A train travelling at a uniform speed for 360 km would have taken 48 minutes less to travel the same distance if its speed were 5 km/hour more. Find the original speed of the train. **(CBSE 2017-4M)**

Ans -let original speed of train = x km/h
we know,
time = distance/speed

first case:
time taken by train = 360/x hour

second case :
time taken by train its speed increase 5 km/h = 360/(x + 5)
question says that
time taken by train in first - time taken by train in 2nd case = 48 min = 48/60 hour
360/x - 360/(x +5) = 48/60 = 4/5
360{ 1/x - 1/(x +5) } = 4/5
360 ×5/4 { 5/(x² +5x)} =1
450 x 5 = x² + 5x
x² +5x -2250 = 0
x = { -5±√(25+9000) }/2
=(-5 ±√(9025))/2
=(-5 ± 95)/2
= -50 , 45
but x ≠ -50 because speed doesn't negative
so, x = 45 km/h
hence, original speed of train = 45 km/h

Q. Three consecutive positive integers are such that the sum of the square of first and product of rest two integers is 46, find the integers. **(CBSE 2010-4M)**
Ans : Let the first number be x, then the other numbers will be (x+1),(x+2)

According to question:-

$$x^2 + (x+1)(x+2) = 46$$

$$x^2 + x^2 + 2x + x + 2 = 46$$

On simplifying above equation we get, $2x^2 + 3x - 44 = 0$

$$2x^2 + 11x - 8x - 44 = 0$$

x(2x+11)-4 (2x+11)=0

(x-4)(2x+11)

On solving we will get $x = -\frac{11}{2}, 4$

Since x can't be negative.

Now substituting value of x in x+1 and x+2 we get

x = 4 and x=6 .

So numbers will be 4, 5 and 6.

Q.The difference of squares of two numbers is 88. If the larger number is 5 less than twice the smaller number, then find two numbers. **(CBSE 2010-4M)**

Q. A trader bought a number of articles for Rs 900. Five articles were found damaged. He sold each of the remaining articles at Rs. 2 more than what he paid for it. He got a profit transaction. Find the number of articles he bought. **(CBSE 2009-6M)**

[E]

Solve for x : $\frac{1}{x+1}+\frac{3}{5x+1}=\frac{5}{x+4}, x \neq -1, \frac{-1}{5}, -4$ **(CBSE 2017-4M)**

Solve for x : $\frac{1}{x-2}+\frac{2}{x-1}=\frac{6}{x}, x \neq 0,1,2$ **(CBSE 2017-4M)**

Solve for x : $\frac{1}{x+1}+\frac{2}{x+2}=\frac{5}{x+4}, x \neq -1,-2,-4$ **(CBSE 2010-4M)**

Find the roots of the equation: $\frac{1}{x+4}-\frac{1}{x-7}=\frac{1}{30}, x \neq -4, 7$ **(CBSE 2010-4M)**

Ans 1 :

$\frac{1}{x+1}+\frac{3}{5x+1}=\frac{5}{x+4}$

$\implies \frac{5x+1+3x+3}{(x+1)(5x+1)}=\frac{5}{x+4}$

$\implies \frac{8x+4}{5x^2+x+5x+1}=\frac{5}{x+4}$

$\implies \frac{8x+4}{5x^2+6x+1}=\frac{5}{x+4}$

Do the cross multiplication,we get

$\implies (8x+4)(x+4)$
$=5(5x^2+6x+1)$

$\implies (8x^2+32x+4x+16)=25x^2+30x+5$

$\implies (8x^2+36x+16)=25x^2+30x+5$

$\implies 0=25x^2+30x+5-8x^2-36x-16$

$\implies 17x^2-6x-11=0$

Splitting the middle term, we get

$\implies 17x^2-17x+11x-11=0$

$\implies 17x(x-1)+11(x-1)=0$

$\implies (x-1)(17x+11)=0$

$\implies x-1=0\ Or\ 17x+11=0$

$\implies x=1\ Or\ x=\frac{-11}{17}$

[F]

Q. A motor boat whose speed is 18 km/hr in still water takes 1hr more to go 24 km upstream than to return downstream to the same spot. Find the speed of the stream. **(CBSE 2018-4M)**

Ans - Given parameters:

The speed of the motorboat in still water =18 kmph

Let us consider

The speed of the stream = s

Speed of boat upstream = Speed of a boat in still water – the speed of a stream

Speed of boat upstream = 18 – s

Speed of boat downstream = Speed of a boat in still water + speed of a stream

Speed of boat downstream = 18 + s

Time is taken for upstream = Time taken to cover downstream + 1

time =distance/speed

Now, Distance/Speed (of Upstream) = Distance/Speed (of downstream) + 1

24/ (18 – s) = [24/(18 + s)] + 1

24(18+s) = 24(18−s) + (18−s)(18+s)

s2 + 48s − 324 = 0

s2 + 54s − 6s − 324 = 0

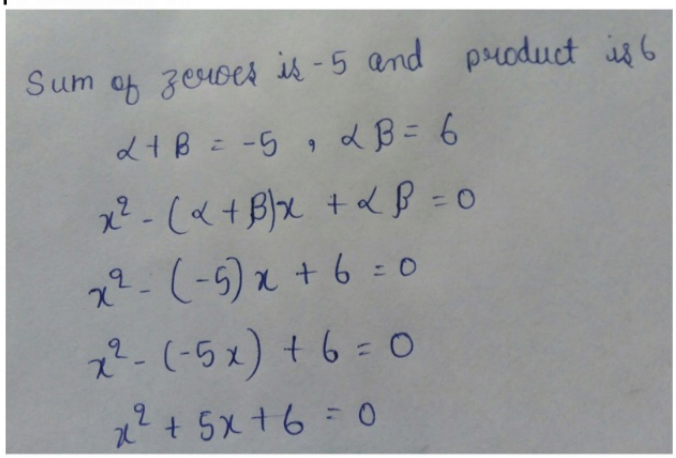
(s+54)(s−6) = 0
s = 6,−54 but
s ≠−54
Since the speed of steam cannot be negative.
∴ s = 6km/hr

Q. Speed of a boat in still water is 15 km/h. It goes 30 km upstream and returns back at the same point in 4 hours 30 minutes. Find the speed of the stream. **(CBSE 2017-4M)**

Q. A motor boat whose speed is 20km/hr in still water, takes 1 hour more to go upstream than downstream to the same spot. Find the speed of the stream. **(CBSE 2010-4M)**

[OTHERS]

Find a quadratic polynomial, the sum of whose ^eroes is Ɓ5 and their product is 6.



Find the quadratic polynomial whose zeroes are reciprocal of the zeroes of the polynomial f (x) = ax^2 + bx + c .

A.P.

Find the sum of first 25 terms of an A.P. whose nth term is 1-4n. **CBSE2007-2M**
Which term of the A.P. 3, 15, 27, 39 ... will be 132 more than its 54th term? **CBSE2007-3M**
The nth term of an A.P. is 6n + 2. Find its common difference. **CBSE2008-1M**
Find the 10th term from the end of the A.P. 8, 10, 12,……,126.
CBSE2008-2M
For what value of *p,* are *2p*- 1, 7 and 3 *p* three consecutive terms of an A.P.? **CBSE2009-1M**
If S_n, the sum of first *n* terms of an A.P. is given by $S_n = 3n^2 - 4n$ then find its *nth* term. **CBSE2009-2M**
The sum of 4th and 8th terms of an A.P. is 24 and sum of 6th and 10th terms is 44. Find A.P. **CBSE2009-3M**
If $\frac{4}{5}$, a, 2 are three consecutive terms of an A.P., then find the value 5 of a. **CBSE2009-1M**
Which term of the A.P. · 3, 15, 27, 39 ... will be 120 more than its 21^{st} term? **CBSE2009-2M**
The sum of first six terms of an arithmetic progression is 42. The ratio of its 10th term to its 30th term is 1: 3. Calculate the first and the thirteenth term of the A.P. **CBSE2009-3M**
If the sum of first p terms of an A.P., is ap^2+bp, find its common difference.
CBSE2010-1M
In an A.P., the first term is 2, the last term is 29 and sum of terms is 155. Find the common difference of A.P. **CBSE2010-2M**
In an A.P., the sum of first ten terms is -150 and the sum of its next ten terms is -550. Find A.P. **CBSE2010-3M**
If the first m terms of an A.P. is $2m^2+3m$, then what is its second term? **CBSE2010-1M**
In an A.P., the first term is -4, the last term is 29 and the sum of all its terms is 150. Find its common difference. **CBSE2010-2M**
The sum of first sixteen terms of an A.P. is 112 and the sum of its next fourteen terms is 518. Find A.P. **CBSE2010-3M**
In an AP, if d=-2, n=5 and a_n=0. Find the value of a. **CBSE2011-1M**
Find whether -150 is a term of the AP 17,12,7,2,.....? **CBSE2011-2M**
Find the value of the middle term of AP: -6,-2,2,.....,58. **CBSE2011-3M**
Determine the AP whose fourth term is 18 and the difference of the ninth term from the fifteenth term is 30. **CBSE2011-3M**
Find the value of a_{30}-a_{20} for the AP 2,7,12,17,..... **CBSE2011-1M**
Find sum of first n terms of AP whose nth term is 5n-1. Hence find the sum of first 20 terms.
CBSE2011-3M
If the nth term of AP is (2n+1) then find the sum of its first three terms. **CBSE2012-1M**
Find the common difference of AP whose first term is 5 and the sum of first four terms is half the sum of next four terms. **CBSE2012-4M**
Find the sum of first 20 odd natural numbers. **CBSE2012-1M**
Sum of first 14 terms of an AP is 1505 and its first term is 10. Find 25^{th} term. **CBSE2012-4M**
Find the common difference of AP: $\frac{1}{p}, \frac{1-p}{p}, \frac{1-2p}{p}, \ldots\ldots$ **CBSE2013-1M**
Find the number of terms in AP: $18, 15\frac{1}{2}, 13, \ldots\ldots, -49\frac{1}{2}$.Also, find the sum of all its terms.
CBSE2013-3M
If the sum of first 7 terms of an AP is 49 and that of first seventeen terms is 289 then find the sum of first n terms. **CBSE2013-4M**
The first three terms of AP are 3y-1, 3y+5 and 5y+1. Find the value of y. **CBSE2014-1M**
The first and last terms of an AP are 7 and 49 respectively. If the sum of all its terms is 420, find the common difference. **CBSE2014-2M**

If the 7^{th} term of AP is $\frac{1}{9}$ and 9^{th} term is $\frac{1}{7}$. Find its 63^{rd} term. **CBSE2014-3M**

In an AP of 50 terms, sum of first 10 terms is 210 and sum of its last 15 terms is 2565. Find the AP. **CBSE2014-4M**

In an AP, if $S_5 + S_7 = 167$ and $S_{10} = 235$, then find the AP, where S_n denotes the sum of its first n terms. **CBSE2015-2M**

The 14th term of an AP is twice its 8th term. If its 6th term is –8, then find the sum of its first 20 terms. **CBSE2015-3M**

Find the 60th term of the AP 8, 10, 12, ..., if it has a total of 60 terms and hence find the sum of its last 10 terms. **CBSE2015-4M**

Find the middle term of AP: 6,13,20,.....,216. **CBSE2015-1M**

If S_n denotes sum of first n terms of an AP then prove that $S_{12}=3(S_8-S_4)$.
CBSE2015-3M

For what value(s) of k will k+9, 2k-1 and 2k+7 are the consecutive terms of an AP?
CBSE2016-1M

The 4^{th} term of AP is 0. Prove that 25^{th} term is 3 times 11^{th} term. **CBSE2016-2M**

The digits of a positive three digit number are in AP and their sum is 15. The number obtained by reversing the digits is 594 less than the original number. Find the number.
CBSE2016-3M

Find the 9th term from the end (towards the first term) of the A.P. 5, 9, 13, ..., 185.
CBSE2016-1M

How many terms of the A.P. 18, 16, 14, ... be taken so that their sum is zero? **CBSE2016-2M**

If the sum of first 7 terms of an A.P. is 49 and that of its first 17 terms is 289,find the sum of first *n* terms of the A.P. **CBSE2016-3M**

What is the common difference of an A.P. in which $a_{21} - a_7 = 84$? **CBSE2017-1M**

Which term of the progression $20, 19\frac{1}{4}, 18\frac{1}{2}, 17\frac{3}{4}, \ldots$ is the first negative term? **CBSE2017-2M**

The first term of an A.P. is 5, the last term is 45 and the sum of all its terms is 400. Find the number of terms and the common difference of the A.P. **CBSE2017-3M**

If the ratio of the sum of the first n terms of two A.Ps is (7n + 1): (4n + 27), then find the ratio of their 9th terms. **CBSE2017-4M**

In an AP, if the common difference (d) = –4, and the seventh term (a_7) is 4, then find the first term. **CBSE2018-1M**

Find the sum of first 8 multiples of 3. **CBSE2018-2M**

The sum of four consecutive numbers in an AP is 32 and the ratio of the product of the first and the last term to the product of two middle terms is 7 : 15. Find the numbers.
CBSE2018-4M

Write the m^{th} term of $\frac{1}{k}, \frac{1+k}{k}, \frac{1+2k}{k}, \ldots\ldots$ **CBSE2018-1M**

The 5th and 15th terms of an A.P. are 13 and –17 respectively. Find the sum of first 21 terms of the A.P. **CBSE2018-2M**

The sum of the first n terms of an A.P. is $5n^2 + 3n$. If its m^{th} term is 168, find the value of m. Also find the 20th term of the A.P. **CBSE2018-4M**

The 4th and the last terms of an A.P. are 11 and 89 respectively. If there are 30 terms in the A.P., find the A.P. and its 23rd term. **CBSE2018-4M**

In an A.P if sum of its first n terms is $3n^2 + 5n$ and its kth term is 164, find the value of k.
CBSE2018-3M

If the 17th term of an A.P. exceeds its 10th term by 7, find the common difference of the A.P. **CBSE2018-1M**

The first and the last terms of an A.P. are 17 and 350 respectively. If its common difference is 9, find the number of terms in the A.P. and find their sum. **CBSE2018-2M**

Find the common difference of an A.P. whose first term is 5 and the sum of its first four terms is half the sum of its next four terms. **CBSE2018-4M**

Find three numbers in A.P. whose sum is 15 and whose product is 105. **CBSE2018-4M**

Triangles

In ΔABC, DE||BC. IF DE = $\frac{2}{3}$BC and area of ΔABC = 81 cm^2, find the area of ΔADE. **(CBSE 2009-1M)**

In ΔLMN, $\angle L = 60^0$, $\angle M = 50^0$. If $\Delta LMN \sim \Delta PQR$, find $\angle R$. **(CBSE 2010-1M)**

In fig 1, PT=2 cm, TR=4 cm, ST||QR. Find the ratios of are of ΔPST & ΔPQR. **(CBSE 2010-1M)**

In fig.2, $\Delta AHK \sim \Delta ABC$. If AK=10cm, BC=3.5 cm, HK=7 cm. Find AC. **(CBSE 2010-1M)**

In fig 5, MN||AB, BC=7.5cm, AM=4cm, MC=2cm. Find BN. **(CBSE2010-1M)**

In ΔPRQ, ST || RQ, PS = 3 cm and SR = 4 cm. Find the ratio of the area of ΔPST to the area of ΔPRQ. **(CBSE2017-1M)**

Given $\Delta ABC \sim \Delta PQR$, if $\frac{AB}{PQ} = \frac{1}{3}$, then find $\frac{ar\,\Delta ABC}{ar\,\Delta PQR}$. **(CBSE2018-1M)**

In fig-2, AB||DE, BD||EF. Prove that $DC^2 = CF \times AC$. $\angle R$ **(CBSE 2007, 2010-2M)**

In ΔABC, AB=AC, D is a point on side AC such that $BC^2 = AC \times CD$. Prove that BD=BC. **(CBSE 2010-2M)**

P and Q are points on sides CA and CB respectively of ABC, right angled at C. Prove that $AQ^2+BP^2=AB^2+PQ^2$. **(CBSE 2007-2M)**

In. Fig. 9, PQ = 24 cm, QR = 26 cm, $\angle PAR = 90^0$, PA = 6 cm and AR = 8 cm. Find $\angle QPR$. **(CBSE 2008-2M)**

P and Q are points on the sides AB and AC respectively of $\triangle ABC$ such that AP =3.5 cm, PB = 7 cm, AQ = 3 cm and QC = 6 cm. If PQ = 4.5 cm, find BC. **(CBSE 2008-2M)**

The perpendicular AD on the base BC of ΔABC intersects BC in D such that BD=3CD. Prove that $2AB^2=2AC^2+BC^2$. **(CBSE 2010-3M)**

In fig4, ABC is a right angles triangle, right angled at $DE \perp AB$. Prove that $\Delta ABC \sim \Delta ADE$, hence find the lengths of AE and DE. **(CBSE 2010-3M)**

In fig.3, ABC is right angled at C. D is the midpoint of BC. Prove that $AB^2=4AD^2-3AC^2$. **(CBSE 2010-3M)**

In ΔABC, right angles at A, BL and CM are two medians. Prove that $4(BL^2+CM^2) = 5BC^2$. **(CBSE 2010-3M)**

In given figure 7, $\angle 1 = \angle 2$ & $\Delta NSQ \cong \Delta MTR$ then prove that $\Delta PTS \sim \Delta PRQ$. **(CBSE 2017-3M)**

Prove that the area of an equilateral triangle described on one side of the square is equal to half the area of the equilateral

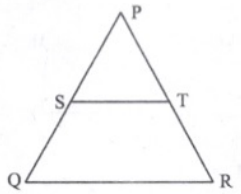


Fig. 1

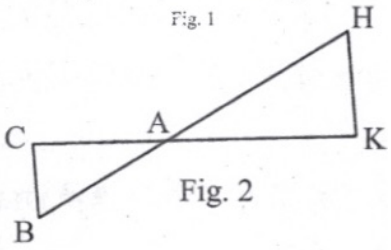


Fig. 2

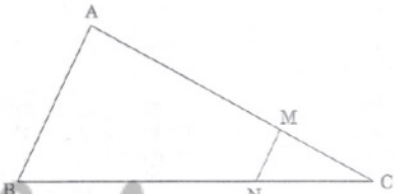


Figure 5

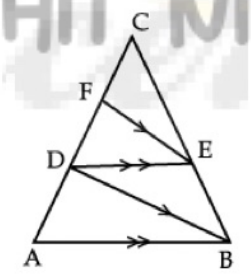


Figure - 2

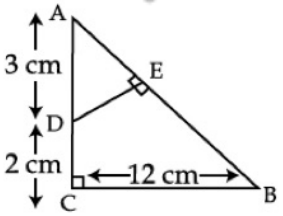
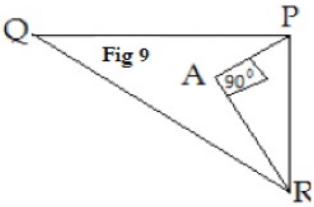


Figure - 4



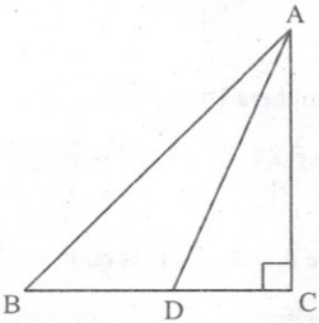


Fig. 3

C.

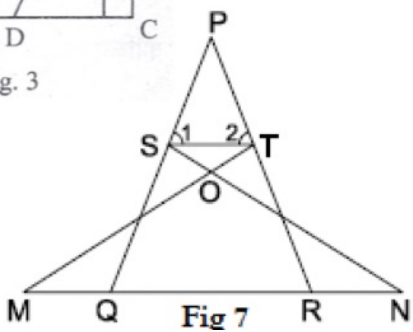


Fig 7

triangle described on one of its diagonal. **(CBSE 2018-3M)**

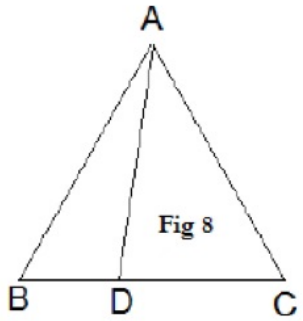
If the diagonals of a quadrilateral divide each other proportionally prove that it is a trapezium. **(CBSE 2008-3M)**

Two triangles ABC and DBC are on the same base BC and on the same side of BC in which $\angle A = \angle D = 90^0$. If CA and BD meet each other at E, show that AE.EC = BE.ED. **(CBSE 2008-3M)**

In an equilateral triangle ABC(Fig 8), D is a point on the side BC such that BD=$\frac{1}{3}$ BC. Prove that $9AD^2=7AB^2$. **(CBSE 2017-3M & 2018-4M)**

If the area of two similar triangles are equal, prove that they are congruent. **(CBSE 2018-3M)**

Prove that the ratio of the areas of two similar triangles is equal to the ratio of the squares of their corresponding sides. Using the above theorem prove the following: The area of the equilateral triangle described on the side of a square is half the area of the equilateral triangle described on its diagonal. **(CBSE 2008, 2009, 2010-4M)**

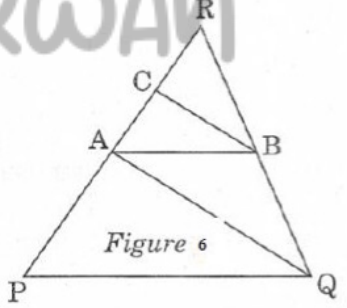


Prove that the ratio of the areas of two similar triangles is equal to the ratio of the squares of their corresponding sides. Also, in ΔABC, XY is parallel to BC and it divides triangle ABC into two parts of equal area. Prove that $\frac{BX}{AB}=\frac{\sqrt{2}-1}{\sqrt{2}}$. **(CBSE 2008-6M)**

Prove that in a triangle, if square of one side is equal to the sum of the squares of the other two sides, then angle opposite to first side is right angle. **(CBSE 2010-4M)**

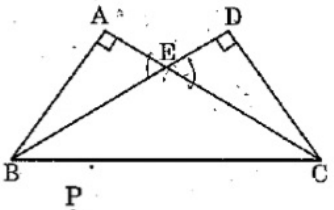
Prove that if the areas of two similar triangles are equal then the triangles are congruent. **(CBSE 2010-4M)**

If a line is drawn parallel to one side of a triangle to intersect other two sides in distinct points, prove that the other two sides are divided in the same ratio. Using the above, do the following. In fig 6, PQ||AB, AQ||CB. Prove that $AR^2=PR\times CR$. **(CBSE 2007, 2010-4M)**



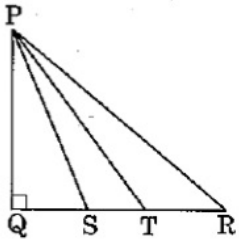
If a line is drawn parallel to one side of a triangle to intersect other two sides in distinct points, prove that the other two sides are divided in the same ratio. Also, In triangle ABC, DE||BC and BD=CE. Prove that ABC is an isosceles triangle. **(CBSE 2007, 6M)**

Prove that, in a right triangle, the square on the hypotenuse is equal to the sum of the squares on the other two sides. **(CBSE 2018-4M)**

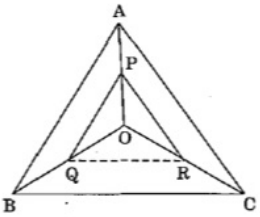


Two triangles ABC and DBC are on the same base BC in which $\angle A = \angle D = 90^0$. If CA and BD meet each other at E, show that AE x CE =BE x ED. **(CBSE SQP-2M)**

The diagonals of a trapezium ABCD with AB||DC intersect each other at point O. If AB = 2CD, find the ratio of the areas of triangles AOB and COD. **(CBSE SQP-3M)**

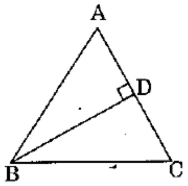


In figure, *S* and trisect the side *QR* of **a** right triangle PQR. Prove that : $8PT^2=3PR^2+5PS^2$ **(CBSE SQP-3M)**

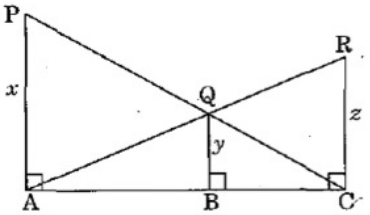


In figure, PQ||AB and PR||AC**.** Prove that QR||BC. **(CBSE SQP-2M)**

In figure, PA, QB and RC are each perpendicular to AC.



Prove that $\frac{1}{x}+\frac{1}{y}=\frac{1}{z}$. **(CBSE SQP-4M)**



35. In an isosceles triangle ABC with AB = AC, BD is perpendicular from B to the side AC. Prove that $BD^2-CD^2= 2CD\times AD$. **(CBSE SQP-4M)**

Co-ordinate Geometry

Distance formula

2007, 2008, 2009, 2009, 2010, 2010, 2011, 2011, 2011, 2011, 2012, 2012, 2012, 2013, 2013, 2014, 2015, 2015, 2016, 2016, 2017, 2018, 2018, 2018, 2018, 2020

Section formula

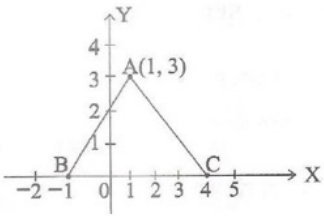
2007, 2008, 2009, 2009, 2010, 2010, 2010, 2010, 2011, 2011, 2012, 2012, 2012, 2012, 2013, 2014, 2015, 2015, 2016, 2016, 2016, 2016, 2017, 2018, 2018, 2018

Mid-point formula

2009, 2010, 2011, 2012, 2017

1. Show that the points (7, 10), (-2, 5) and (3, -4) are the vertices of an isosceles right triangle. **CBSE2007-3M**
2. In what ratio does the line *x*-y-2 = 0 divides the line segment joining (3, -1) and (8, 9)? **CBSE2007-3M**
3. For what value of p, are points (2, 1), (p, -1) and (-1, 3) collinear? **CBSE2008-2M** Not in 2020-21
4. If the distances of P(x, y) from the points A(3, 6) and B(-3, 4) are equal, prove that 3x +y = 5. **CBSE2008-3M**
5. Determine the ratio in which the line 3x 4y – 9 = 0 divides the line-segment joining the points (1, 3) and (2, 7). **CBSE2008-3M**
6. Find the value of ***a*** so that the point (3, *a)* lies on the line represented by *2x*- 3y = 5. **CBSE2009-1M**
7. Find the point on y-axis which is equidistant from the points (5, -2) and (-3, 2). **CBSE2009-3M**
8. The line segment joining the points A (2,1) and B (5, -8) is trisected at the points P and Q such that P is nearer to A. If P also lies on the line given by *2x- y + k* = 0, find the value of *k.* **CBSE2009-3M**
9. If P*(x, y)* is any point on the line joining the points A *(a,* 0) and B (0, *b),* then show that $\frac{x}{a}+\frac{y}{b}=1$. **CBSE2009-3M**
10. If the points A (4 , 3) and B (x , 5) are on the circle with the centre O(2, 3), find the value of x. **CBSE2009-2M**
11. Find the ratio in which the point (2, y) divides the line segment joining the points A (-2, 2) ·and B (3, 7). Also find the value of y. **CBSE2009-3M**
12. Find the area of the quadrilateral ABCD whose vertices are A (- 4,- 2), B (- 3,- 5), C (3, - 2) and D (2, 3). **CBSE2009-3M**
13. If P(2,p) is the mid-point of the line segment joining the points A(6,-5) and B(-2,11), find the value of p. **CBSE2010-1M**
14. If A(1,2), B(4,3) and C(6,6) are the vertices of parallelogram ABCD, find the coordinates of vertex D. **CBSE2010-1M**
15. Point P divides the line segment joining the points A(2,1) and B(5,-8) such that $\frac{AP}{AB}=\frac{1}{3}$. If p lies on the line 2x-y+k=0, find the value of k. **CBSE2010-3M**
16. If R(x,y) is a point on the line segment joining the points P(a,b) and Q(b,a), then prove that x+y=a+b. **CBSE2010-3M**
17. Find the distance between the points, A(2a,6a) and B($2a+\sqrt{3}a, 5a$) .**CBSE2010-1M**
18. Find the value of k if P(4,-2) is the midpoint of line segment joining the points A(5k,3) and B(-k,-7). **CBSE2010-1M**
19. If point P($\frac{1}{2}, y$) lies on line segment joining the points A(3,-5) and B(-7,9), then find the ratio in which P divides AB. Also find the value of y. **CBSE2010-3M**
20. Find the value of k for which the points A(9,k), B(4,-2) and C(3,-3) are collinear. **CBSE2010-3M**
21. Find the quadrant in which the point P that divides the line segment joining the points A(2,-5) and B(5,2) in the ratio 2:3. **CBSE2011-1M**
22. The mid-points of line segment AB is the point P(0,4). If the coordinates of B are (2,-3) then find the coordinates of A. **CBSE2011-1M**
23. Find the values of x for which the distance between the points P(x,4) and Q(9,10) is 10 units. **CBSE2011-2M**
24. If (3,3), (6,y), (x,7) and (5,6) are the vertices of parallelogram taken in order then find

the values of x and y. **CBSE2011-3M**

25. If two vertices of equilateral triangle are (3,0) and (6,0), find the third vertex. **CBSE2011-3M**
26. Find the value of k, if the points P(5,4), Q(7,k) and R(9,-2) are collinear. **CBSE2011-3M**
27. Find the area of the triangle formed by points A(a,0), O(0,0) and B(0,b). **CBSE2011-1M**
28. Find a relation between x and y such that the point P(x,y) is equidistant from the points A(1,4) and B(-1,2). **CBSE2011-2M**
29. Find the area of quadrilateral formed by the vertices A(3,-1), B(9,-5), C(14,0) and D(9,19). **CBSE2011-3M**
30. Find the coordinates of the point which divides the line segment joining the points A(2,-3) and B(-4,-6) into three equal parts. **CBSE2011-3M**
31. Show that the vertices A(3,5), B(6,0), C(1,-3) and D(-2,2) are the vertices of square ABCD. **CBSE2011-3M**
32. Find the distance of the point (-3,4) from the x-axis. **CBSE2012-1M**
33. P(5,-3), Q(3,y) are the points of trisection of the line segment joining the points A(7,-2) and B(1,-5). Find the values of y. **CBSE2012-1M**
34. Find the value of k, if P(2,4) is equidistant from the points A(5,k) and B(k,7). **CBSE2012-2M**
35. Find the co-ordinates of point P, which lies on line segment joining A(-2,-2) and B(2,-4) such that AP= $\frac{3}{7}$ AB. **CBSE2012-3M**
36. Find the area of quadrilateral formed by the vertices A(-3,-1), B(-2,-4), C(4,-1) and D(3,4). **CBSE2012-3M**
37. If the points A(x,y), B(3,6) and C(-3,4) are collinear , show that x-3y+15=0. **CBSE2012-3M**
38. If the coordinates of one end of a diameter of circle are (2,3) and that of centre are (-2,5) then find the coordinates of other end of diameter. **CBSE2012-1M**
39. Find the coordinates of the point P dividing the line segment joining the points A(1,3) and B(4,6) in the ratio 2:1. **CBSE2012-1M**
40. If a point A(0,2) is equidistant from B(3,p) and C(p,5), then find the values of p. **CBSE2012-2M**
41. A point P divides the line segment joining the points A(3,-5) and B(-4,8) such that $\frac{AP}{PB}=\frac{k}{1}$. If p lies on the line x+y=0, then find the value of k. **CBSE2012-3M**
42. If the vertices of triangle are (1,-3), (4,p) and (-9,7) and its area is 15 sq.units. Find the value(s) of p. **CBSE2012-3M**
43. 

Find the area of the triangle given in the figure. **CBSE2013-1M**
44. Prove that the points (7,10), (-2,5) and (3,-4) are the vertices of isosceles right triangle. **CBSE2013-3M**
45. Find the ratio in which the y-axis divides the line segment joining the vertices (-4,-6) and (10,12). Also find the coordinates of point of division. **CBSE2013-3M**
46. The three vertices of parallelogram ABCD are A(3,-4), B(-1,-3) and C(-6,2). Find the coordinates of vertex D and also find its area. **CBSE2013-4M**
47. Find the value of x if the points A(x,2), B(-3,-4) and C(7,-5) are collinear. **CBSE2014-1M**
48. Points A(-1,y) and B(5,7) lie on a circle with centre O(2,-3y). Find the values of y. Hence find the radius of circle. **CBSE2014-3M**
49. If the points P(-3,9), Q(a,b) and R(4,-5) are collinear and a+b=1, find the values of a

and b. **CBSE2014-3M**

50. Find the ratio in which P(x,2) divides the line segment joining points A(12,5) and B(4,-3). Also find value of x. **CBSE2014-4M**

51. The points A(4, 7), B(p, 3) and C(7, 3) are the vertices of a right triangle, right-angled at B. Find the value of p. **CBSE2015-2M**
52. Find the relation between x and y if the points A(x, y), B(–5, 7) and C(–4, 5) are collinear. **CBSE2015-2M**
53. If the coordinates of points A and B are (–2, –2) and (2, –4) respectively, find the coordinates of P such that AP= $\frac{3}{7}$ AB, where P lies on the line segment AB. **CBSE2015-3M**
54. Find the values of k so that the area of the triangle with vertices (1, –1), (–4, 2k) and (–k, –5) is 24 sq. units. **CBSE2015-4M**
55. If A(5,2), B(2,-2) and C(-2,t) are the vertices of right angles triangle with $\angle B = 90^0$, then find the value of t. **CBSE2015-2M**
56. Find the ratio in which the point P($\frac{3}{4}, \frac{5}{12}$) divides the line segment joining the points A($\frac{1}{2}, \frac{3}{2}$) and B(2,-5). **CBSE2015-2M**
57. Find the area of triangle ABC with A(1,-4) and mid-points of sides through A being (2,-1) and (0,-1). **CBSE2015-3M**
58. Find the area of quadrilateral formed by the vertices A(-4,8), B(-3,-4), C(0,-5) and D(5,6). **CBSE2015-4M**
59. Prove that points (3,0), (6,4) and (-1,3) are the vertices of a right angles isosceles triangle. **CBSE2016-2M**
60. Let P and Q be the points of trisection of the line segment joining the points A(2,-2) and B(-7,4) such that P is near to A. Find the coordinates of P and Q. **CBSE2016-2M**
61. If the point P(x,y) is equidistant from the points A(a+b,b-a) and B(a-b, a+b) then prove that bx=ay. **CBSE2016-3M**
62. Find the ratio in which *y*-axis divides the line segment joining the points A(5,−6) and B(−1,−4). Also find the coordinates of the point of division. **CBSE2016-2M**
63. The *x*-coordinate of a point P is twice its *y*-coordinate. If P is equidistant from Q(2, –5) and R(–3, 6), find the coordinates of P. **CBSE2016-2M**
64. ABC is a triangle coordinates of whose vertex A are (0, –1). D(1,0) and E(0,1) respectively are the mid-points of the sides AB and AC. If F is the mid-point of BC, find the areas of Δ ABC and Δ DEF. **CBSE2016-3M**
65. Prove that the area of a triangle with vertices (*t*, *t*−2) , (*t*+2, *t*+2) and (*t*+3, *t*) is independent of *t*. **CBSE2016-4M**
66. A line intersects the y-axis and x-axis at the points P and Q respectively. If (2, -5) is the mid-point of PQ, then find the coordinates of P and Q. **CBSE2017-2M**
67. If the distances of P(x, y) from A(5, 1) and B(-1, 5) are equal, then prove that 3x = 2y. **CBSE2017-2M**
68. In what ratio does the point $(\frac{24}{11}, y)$ divide the line segment joining the points P(2, -2) and Q(3, 7) ? Also find the value of y. **CBSE2017-3M**
69. If the points A(k + 1, 2k), B(3k, 2k + 3) and C(5k-1, 5k) are collinear, then find the value of k. **CBSE2017-4M**
70. Find the distance of a point P(x, y) from the origin. **CBSE2018-1M**
71. Find the ratio in which P(4, m) divides the line segment joining the points A(2, 3) and B(6, –3). Hence find m. **CBSE2018-2M**
72. If A(–2, 1), B(a, 0), C(4, b) and D(1, 2) are the vertices of a parallelogram ABCD, find

the values of a and b. Hence find the lengths of its sides. **CBSE2018-3M**

73. If A(–5, 7), B(–4, –5), C(–1, –6) and D(4, 5) are the vertices of a quadrilateral, find the area of the quadrilateral ABCD. **CBSE2018-3M**
74. Find the value of y for which the distance between the points (2, –3) and (10, y) is 10 units. **CBSE2018-1M**
75. If the point (0, 2) is equidistant from the points (3, k) and (k, 5), find the value of k. **CBSE2018-2M**
76. The line segment joining the points A(2, 1) and B(5, –8) is trisected at the points P and Q, where P is nearer to A. If P lies on the line 2x – y + k = 0, find the value of k. **CBSE2018-3M**
77. The x-coordinate of a point P is twice its y-coordinate. If P is equidistant from the points Q(2, –5) and R(–3, 6), find the coordinates of P. **CBSE2018-3M**
78. A(5, 1); B(1, 5) and C(–3, –1) are the vertices of triangle ABC. Find the length of median AD. **CBSE2018-1M**
79. Find the linear relation between x and y such that P(x, y) is equidistant from the points A(1, 4) and B(–1, 2). **CBSE2018-2M**
80. If coordinates of two adjacent vertices of a parallelogram are (3, 2), (1, 0) and diagonals bisect each other at (2, –5), find coordinates of the other two vertices. **CBSE2018-3M**
81. If the area of triangle with vertices (x, 3), (4, 4) and (3, 5) is 4 square units, find x. **CBSE2018-3M**
82. If the distance between the points P(x, 2) and Q(3, –6) is 10 units, find the value of x. **CBSE2018-1M**
83. Find a relation between x and y such that the point P(x, y) is equidistant from the points A(1, 4), B(–1, 2). **CBSE2018-2M**
84. The line segment joining the points A(3, –4) and B(1, 2) is trisected at the points P and Q such that P is nearer to A. If the co-ordinates of P and Q are (p, – 2) and $(\frac{5}{3}, q)$ respectively, find the values of p and q. **CBSE2018-3M**
85. Find the ratio in which y-axis divides the line-segment joining the points A(5, –6) and B(–1, 4). Also, find the co-ordinates of the point of division. **CBSE2018-3M**

Trigonometry

If $\sin\theta = \frac{1}{3}$, then find the value of $(2\cot^2\theta + 2)$. **CBSE2009-1M**

If $\sec^2\theta(1+\sin\theta)(1-\sin\theta) = k$, find the value of k. **CBSE2009-1M**

If $3x=\text{cosec}\,\theta$ and $\frac{3}{x} = \cot\theta$, find the value of $3(x^2 - \frac{1}{x^2})$. **CBSE2010-1M**

If $6x=\sec\theta$ and $\frac{6}{x} = \tan\theta$, find the value of $9(x^2 - \frac{1}{x^2})$. **CBSE2010-1M**

The angle of elevation of a top of a tower from a point on the ground which is 30 m away from the foot of the tower is 45^0. Find the height of the tower. **CBSE2011-1M**

At some time of the day, the length of the shadow of the tower is equal to its height. Find the suns altitude at that time. **CBSE2011-1M**

A kite is flying at a height of 30 m from the ground. The length of the string from the kite to the ground is 60 m. Assuming that there is no slack in the string; find the angle of elevation of the kite at the ground. **CBSE2012-1M**

The length of the shadow of a tower on the plane ground is $\sqrt{3}$ time the height of the tower. Find the angle of elevation of the sun. **CBSE2012-1M**

The angle of depression of a car, standing on the ground, from the top of a 75 m high tower is 30^0. Find the distance of the car from the base of the tower. **CBSE2013-1M**

A ladder makes an angle of 60^0 with the ground when placed against a wall. If the foot of the ladder is 2 m away from the wall, find the length of the ladder. **CBSE2014-1M**

The angle of depression of a car parked on the road from the top of a 150 m high tower is 30^0. Find the distance of the car from the tower. **CBSE2014-1M**

The tops of two towers of height x and y, standing on level ground, subtend angles of 300 and 600 respectively at the centre of line joining their feet, then find $\frac{x}{y}$. **CBSE2015-1M**

A tower AB is 20 m high and BC, its shadow on the ground, is 20 3 m long. Find the Sun's altitude. **CBSE2015-1M**

AB is a 6 m high pole and CD is a ladder inclined at an angle of 60° to the horizontal and reaches up to a point D of pole. If AD = 2.54 m, find the length of the ladder. (use $\sqrt{3}$ = 1.73) **CBSE2016-1M**

An observer, 1.7 m tall, is $20\sqrt{3}$ m away from a tower. The angle of elevation from the eye of observer to the top of tower is 30°. Find the height of tower. **CBSE2016-1M**

If a tower 30 m high, casts a shadow $10\sqrt{3}$ m long on the ground, then what is the angle of elevation of the sun? **CBSE2017-1M**

The ratio of the height of a tower and the length of its shadow on the ground is $\sqrt{3}:1$. What is the angle of elevation of the sun ? **CBSE2017-1M**

What is the value of ($\cos^2 67° - \sin^2 23°$)? **CBSE2018-1M**

If $\sin\theta + \cos\theta = \sqrt{2}\cos(90^0 - \theta)$ find value of $\cot\theta$. **CBSE2018-1M**

If $\sqrt{3}\tan\theta = 3\sin\theta$, find the value of $\sin\theta$. **CBSE2018-1M**

Evaluate without using trigonometric tables. **CBSE2018-2M**

$$\frac{\sin 18^0}{\cos 72^0} + \sqrt{3}(\tan 10^0 \times \tan 30^0 \times \tan 40^0 \times \tan 50^0 \times \tan 80^0)$$

If cot θ = $\frac{15}{8}$, then find the value of $\frac{(2+2\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(2-2\cos\theta)}$ **CBSE2009-2M**

Find the value of $\tan 30^0$ geometrically. **CBSE2009-2M**

Simplify: $\frac{\sin^3\theta + \cos^3\theta}{\sin\theta + \cos\theta} + \sin\theta\cos\theta$ **CBSE2009-2M**

Find the value of $\text{cosec } 30^0$ geometrically. **CBSE2010-2M**

Find the value of $\sec 45^0$ geometrically. **CBSE2010-2M**

Evaluate without using trigonometric tables. **CBSE2010-2M**

$$\frac{\sin(90^0 - \theta) \times \text{cosec}\theta - \tan(90^0 - \theta) \times \cot\theta + \cos^2 25^0 + \cos^2 65^0}{3\tan 27^0 \times \tan 63^0}$$

Evaluate without using trigonometric tables. **CBSE2010-2M**

$$\tan(90^0 - \theta) \times \cot\theta - \sec(90^0 - \theta) \times \text{cosec}\theta + \sqrt{3}\tan 12^0 \times \tan 60^0 \times \tan 78^0$$

A, B, C are interior angles of triangle ABC. Prove that $\text{cosec}\left(\frac{A+B}{2}\right) = \sec\frac{C}{2}$. **CBSE2018-2M**

Prove that $\frac{\cos A}{1-\tan A} + \frac{\sin A}{1-\cot A} = \sin A + \cos A$. **CBSE2007-3M**

Evaluate without using trigonometric tables. **CBSE2007-3M**

$$\frac{3\cos 55^0}{7\sin 35^0} - \frac{4(\cos 70^0 \times \text{cosec}\, 20^0)}{7(\tan 25^0 \times \tan 5^0 \times \tan 45^0 \times \tan 65^0 \times \tan 85^0)}$$

Prove that $\frac{\cot A-\cos A}{\cot A+\cos A}=\frac{\operatorname{cosec} A-1}{\operatorname{cosec} A+1}$. **CBSE2008-3M**

Prove that $(1+\cot A-\operatorname{cosec} A)(1+\tan A+\sec A)=2$. **CBSE2008-3M**

Find the value of $\sin 30^0$ geometrically. **CBSE2009-3M**

Evaluate:**CBSE2009-3M**

$$\frac{2}{3}\operatorname{cosec}^2 58^0-\frac{2}{3}\cot 58^0\tan 52^0-\frac{5}{3}\tan 13^0\times\tan 37^0\times\tan 45^0\times\tan 53^0\times\tan 77^0$$

Evaluate without using trigonometric tables. **CBSE2009-3M**

$$\frac{\cos 58^0}{\sin 32^0}+\frac{\sin 22^0}{\cos 68^0}-\frac{\cos 38^0\times\operatorname{cosec} 52^0}{\tan 18^0\times\tan 35^0\times\tan 60^0\times\tan 72^0\times\tan 55^0}$$

Prove that $\frac{\tan A}{1-\cot A}+\frac{\cot A}{1-\tan A}=1+\tan A+\cot A$. **CBSE2010-3M**

Prove that $(\operatorname{cosec} A-\sin A)(\sec A-\cos A)=\frac{1}{\tan A+\cot A}$. **CBSE2010-3M**

If $\tan\theta+\sin\theta=m$ & $\tan\theta-\sin\theta=n$ then show that $m^2-n^2=4\sqrt{mn}$. **CBSE2010-3M**

Show that: $(1+\frac{1}{\tan^2\theta})+(1+\frac{1}{\cot^2\theta})=\frac{1}{\sin^2\theta-\sin^4\theta}$. **CBSE2010-3M**

From the top of a tower 100 m high, a man observes two cars on the opposite sides of the tower with angle of depression as 30^0 and 45^0 respectively. Find the distance between the cars. (use $\sqrt{3}$ = 1.73) **CBSE2011- 3M**

A ladder of length 6 m makes an angle of 45^0 with the floor while leaning against a wall of a room. If the foot of the ladder is kept fixed on the floor and it is made to lean against the opposite wall of the room, it make an angle of 60^0 with the floor. Find the distance between the two walls of the room. **CBSE2011- 3M**

The angles of depression of the top and bottom of a tower as seen from the top of cliff of a high $60\sqrt{3}m$ are 45^0 and 60^0 respectively. Find the height of the tower. **CBSE2012- 3M**

The angles of depression of two ships from the top of a light house and on the same side of it are found to be 45^0 and 30^0.If the ships are 200 m apart, find the height of the light house. **CBSE2012- 3M**

The horizontal distance between two poles is 15 m. The angle of depression of the top of fist pole as seen from the top of second pole is 30^0. If the height of second pole is 24 m, find the height of the first pole. (use $\sqrt{3}$ = 1.73) **CBSE2013- 3M**

Two ships are there in the sea on both side of the light house in such a way that two ships and the light house are in a straight line. The angles of depression of two ships as observed from the top of the light house are 60^0 and 45^0. If the height of light house

is 200 m, find the distance between two ships. (use $\sqrt{3}$ = 1.73) **CBSE2014- 3M**

The angle of elevation of an aeroplane from a point on the ground is 60^0. After a flight of 30 seconds the angle of elevation becomes 30^0. If the aeroplane is flying at a constant height of $3000\sqrt{3}\,m$, find the speed of the aeroplane. **CBSE2014- 3M**

The angle of elevation of the top of a building from the foot of the tower is 30^0 and the angle of elevation of the top of the tower from the foot of the building is 45^0. If the tower is 30 m high, find the height of the building. **CBSE2015-3M**

The angle of elevation of an aeroplane from a point A on the ground is 60°. After a flight of 15 seconds, the angle of elevation changes to 30°. If the aeroplane is flying at a constant height of $1500\sqrt{3}$ m, find the speed of the plane in km/hr. **CBSE2015-3M**

The angles of depression of the top and bottom of a 50 m high building from the top of a tower are 45° and 60° respectively. Find the height of the tower and the horizontal distance between the tower and the building. (use $\sqrt{3}$ = 1.73) **CBSE2016- 3M**

Two men on either side of a 75 m high building and in line with base of building observe the angles of elevation of the top of the building as 30° and 60°. Find the distance between the two men. (use $\sqrt{3}$ = 1.73) **CBSE2016- 3M**

On a straight line passing through the foot of a tower, two points C and D are at distances of 4 m and 16 m from the foot respectively. If the angles of elevation from C and D of the top of the tower are complementary, then find the height of the tower. **CBSE2017- 3M**

A moving boat is observed from the top of a 150 m high cliff moving away from the cliff. The angle of depression of the boat changes from 60° to 45° in 2 minutes. Find the speed of the boat in m/h. **CBSE2017- 3M**

If 4 tan θ = 3, evaluate $\left(\frac{4\sin\theta-\cos\theta+1}{4\sin\theta+\cos\theta-1}\right)$. **CBSE2018- 3M**

If tan 2A = cot (A – 18°), where 2A is an acute angle, find the value of A. **CBSE2018- 3M**

Prove that $\frac{1}{\operatorname{cosec}\theta+\cot\theta}-\frac{1}{\sin\theta}=\frac{1}{\sin\theta}-\frac{1}{\operatorname{cosec}\theta-\cot\theta}$. **CBSE2018- 3M**

If $\tan\theta + \sin\theta = m$, $\tan\theta - \sin\theta = n$, show that $m^2 - n^2 = 4\sqrt{mn}$. **CBSE2018- 3M**

Prove that $\left(\frac{1+\tan^2 A}{1+\cot^2 A}\right)=\left(\frac{1-\tan A}{1-\cot A}\right)^2=\tan^2 A$ **CBSE2018- 3M**

Evaluate $\frac{\cos 58^0}{\sin 32^0}+\frac{\sin 22^0}{\cos 68^0}-\frac{\cos 38^0\operatorname{cosec}52^0}{\sqrt{3}(\tan 18^0\tan 35^0\tan 60^0\tan 72^0\tan 55^0)}$ **CBSE2018- 3M**

Prove that $\frac{\sin\theta}{1+\cos\theta}+\frac{1+\cos\theta}{\sin\theta}=2\,cosec\theta$ **CBSE2018- 3M**

If $\cos\theta + \sin\theta = \sqrt{2}\cos\theta$, show that $\cos\theta - \sin\theta = \sqrt{2}\sin\theta$. **CBSE2018- 3M**

A boy standing on a horizontal plane finds a bird flying at a distance of 100 m from him at an elevation of 30°. A girl standing on the roof of 20 metre high building finds the angle of elevation of the same bird to be 45°. Both the boy and the girl are on opposite sides of the bird. Find the distance of bird from the girl. **CBSE2007- 4M**

A state 1.46 m tall, stands on the top of a pedestal. From a point on the ground, the angle of elevation of the top of the statue is 60^0 and from the same point, the angle of elevation of the top of the pedestal is 45^0. Find the height of the pedestal.
(use $\sqrt{3}$ = 1.73) **CBSE2008- 4M**

An aeroplane when flying at a height of 3125 m from the ground passes vertically below another plane at an instant when the angles of elevation of the two planes from the same point on the ground are 30° and 60° respectively. Find the distance between the two planes at that instant. **CBSE2009- 4M**

A straight highway leads to the foot of a tower. A man standing at the top of the tower observes a car at an angle of depression of 30°, which is approaching the foot of the tower with a uniform speed. Six seconds later the angle of depression of the car is found to be 60°. Find the time taken by the car to reach the foot of the tower from this point. **CBSE2009- 4M**

From the top of a 7 m high building, the angle of elevation of top of tower is 60^0 and angle of depression of foot of the tower is 30^0. Find the height of the tower. **CBSE2010- 4M**

From a window (9m above the ground) of a house in a street, the angles of elevation and depression of the top and foot of another house on the opposite side of the street are 30^0 and 60^0 respectively. Find the height of the opposite house and width of the street. (use $\sqrt{3}$ = 1.732) **CBSE2010- 4M**

A vertical pedestal stands on the ground and is surmounted by a vertical flag staff of height 5 m. At a point on the ground the angles of elevation of the bottom and top of the flag staff are 30^0 and 60^0 respectively. Find the height of the pedestal. **CBSE2010- 4M**
Two poles of equal height are standing opposite to each other on either side of the road, which is 100 m wide. From a point between them on road, the angles of elevation of the top of the poles are 60^0 and 30^0, respectively. Find the height of the poles. **CBSE2011- 4M**

The shadow of a tower standing on a level ground is found to be 30 m longer when the suns altitude is 30^0 than when it is 60^0. Find the height of the tower. **CBSE2011- 4M**

The angles of elevation and depression of the top and bottom of a light-house from the top of a 60 m building are 30^0 and 60^0 respectively. Find **CBSE2012- 4M**
(a) the difference between heights of light-house and building.
(b) the distance between the light-house and building.

The angle of elevation of the top of a hill at the foot of tower is 60^0 and angle of depression from the top of the tower of the foot of the hill is 30^0. If the tower height is 50 m, find the height of the hill. **CBSE2012- 4M**

The angle of elevation of the top of a building from the foot of the tower is 30^0 and the angle of elevation of the top of a tower from the foot of the building is 60^0. If the tower is 60 m height, find the height of the building. **CBSE2013- 4M**

The angles of elevation and depression of the top and bottom of a tower from the top of a 60 m building are 30^0 and 60^0 respectively. Find the difference between the heights of building and the tower and also the distance between them. **CBSE2014- 4M**

The angle of elevation of the top of a tower at a distance of 120 m from a point A on the ground is 45^0. If the angle of elevation of the top of a flagstaff fixed at the top of the tower, at A is 60^0, then find the height of the flagstaff. (use $\sqrt{3}$ = 1.732)**CBSE2014- 4M**

From a point P on the ground the angle of elevation of the top of the tower is 30^0 and that of the top of a staff flag fixed on the top of tower is 60^0. If the length of the flag staff is 5 m, find the height of the tower. **CBSE2015- 4M**

At a point A, 20 metres above the level of water in a lake, the angle of elevation of a cloud is 30^0. The angle of depression of the reflection of the cloud in the lake, at A is 60^0. Find the distance of the cloud from A. **CBSE2015- 4M**

A bird is sitting on the top of a 80 m high tree. From a point on the ground, the angle of elevation of the bird is 45°. The bird flies away horizontally in such a way that it remained at a constant height from the ground. After 2 seconds, the angle of elevation of the bird from the same point is 30°. Find the speed of flying of the bird. (use $\sqrt{3}$ = 1.732) **CBSE2016- 4M**

A vertical tower stands on a horizontal plane and is surmounted by a flagstaff of height 5 m. From a point on the ground the angles of elevation of the top and bottom of the Flag staff are 60° and 30° respectively. Find the height of the tower and the distance of the point from the tower. (use $\sqrt{3}$ = 1.732) **CBSE2016- 4M**

An aeroplane is flying at a height of 300 m above the ground. Flying at this height, the angles of depression from the aeroplane of two points on both banks of a river in opposite directions are 45^0 and 60^0 respectively. Find the width of the river. (use $\sqrt{3}$ = 1.732) **CBSE2017- 4M**

The angle of elevation of a cloud from a point 60 m above the surface of the water of a lake is 30° and the angle of depression of its shadow in water of lake is 60°. Find the height of the cloud from the surface of water. **CBSE2017- 4M**

As observed from the top of a 100 m high light house from the sea-level, the angles of depression of two ships are 30^0 and 45^0. If one ship is exactly behind the other on the same side of the light house, find the distance between the two ships. **CBSE2018- 4M**

A statue, 1.46 m tall, stands on a pedestal. From a point on the ground the angle of elevation of the top of the statue is 60^0 and from the same point angle of elevation of the top of the pedestal is 45^0. Find the height of the pedestal. **CBSE2018- 4M**

Prove that $\frac{\sin A - 2\sin^3 A}{2\cos^3 A - \cos A} = \tan A$ **CBSE2018- 4M**

Prove that $(\frac{\sin A}{1-\cos A} - \frac{1-\cos A}{\sin A})(\frac{\cos A}{1-\sin A} - \frac{1-\sin A}{\cos A}) = 4$ **CBSE2018- 4M**

The angle of elevation of the top of a hill at the foot of a tower is 60º and the angle of depression from the top of tower to the foot of hill is 30º. If tower is 50 metre high, find the height of the hill. **CBSE2018- 4M**

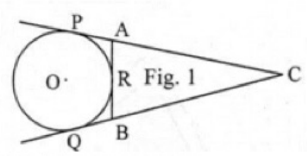
Two poles of equal heights are standing opposite to each other on either side of theroad which is 80 m wide. From a point in between them on the road, the angles of elevation of the top of poles are 60º and 30º respectively. Find the height of the poles and the distances of the point from the poles. **CBSE2018- 4M**

On a horizontal plane there is a vertical tower with a flag pole on the top of the tower. From a point 9 m away from the foot of the tower, the angles of elevation of the top and foot of the flag pole are 60º and 30º respectively. Find the heights of the tower and the flag pole mounted on it. **CBSE2018- 4M**

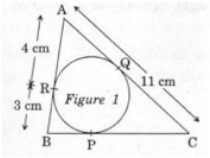
Show that $n(m^2-1) = 2m$, if $m = \sin\theta + \cos\theta$ and $n = \sec\theta + \text{cosec}\,\theta$. **CBSE2018- 4M**

Circles

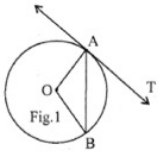
1. In Fig. 1, CP and CQ are tangents to a circle with centre O. ARB is another tangent touching the circle at R. If CP = 11 cm, and BC = 7 cm, then find the length of BR. **(CBSE 2009-1M)**



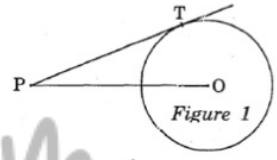
2. In Figure 1, 6. ABC is circumscribing a circle. Find the length of BC. **(CBSE 2009-1M)**



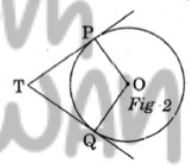
3. In Fig 1, O is the centre of circle, AB is chord and AT is tangent at A. If angle AOB is 100^0 then find measure of angle BAT. **(CBSE 2011-1M)**



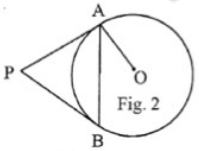
4. In Fig 1, point P is 26 cm away from the centre O of a circle and the length of tangent drawn from P is 24 cm. Find the radius of circle. **(CBSE 2011-1M)**



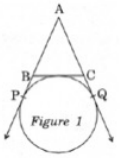
5. In Fig 2, TP and TQ are tangents drawn to a circle with centre O such that angle POQ is 110^0. Find measure of angle PTQ. **(CBSE 2011-1M)**



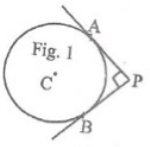
6. In Fig 2, PA & PB are tangents to the circle with centre O. If angle APB is 60^0 then find measure of angle OAB. **(CBSE 2011-1M)**



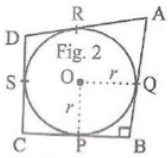
7. In fig 1, AP, AQ and BC are tangents to the circle. If AB=5 cm, AC= 6 cm & BC= 4 cm. Find length of AP. **(CBSE 2011-1M)**



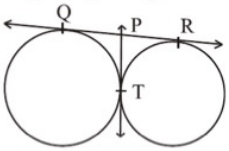
8. In fig 1, PA & PB are tangents and radius of circle is 4 cm. If PA $\perp$ PB then find the length of each tangent. **(CBSE 2013-1M)**



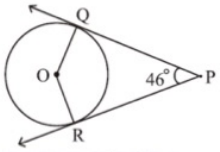
9. In fig 2, if AB=29 cm, AD=23 cm, angle B = 90^0 and DS=5 cm then find the radius of circle. **(CBSE 2013-1M)**



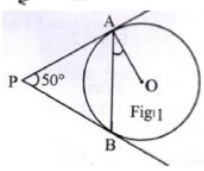
10. In fig 1, if PT=3.8 cm then find the length of QR. **(CBSE 2014-1M)**



11. In fig 2, if $\angle QPR=46^0$, find $\angle QOR$. **(CBSE 2014-1M)**



12. In fig1, $\angle APB=50^0$, find $\angle OAB$. **(CBSE 2015-1M)**



13. In fig1, if AB is a diameter and $\angle CAB=30^0$, find $\angle PCA$. **(CBSE 2016-1M)**

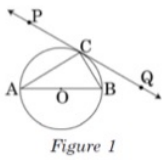


Figure 1

14. If the diameter of a semicircular protractor is 14 cm, then find its perimeter. **(CBSE 2009-1M)**

15. Two circles touch each other externally at P. AB is a common tangent to the circles touching them at A and B. Find the value of $\angle APB$. **(CBSE 2014-1M)**

16. In a right triangle ABC, right angled at B, BC=12 cm & AB=5 cm. Find the radius of the circle inscribed in the triangle. **(CBSE 2014-1M)**

17. If the angle between two tangents drawn from an external point P to a circle of radius a and centre O, is 60^0, then find the length of OP. **(CBSE 2017-1M)**

18. From point Q, 13 cm away from the centre of circle, the length of tangent PQ to the circle is 12 cm. Find the radius of the circle. **(CBSE 2012-1M)**

19. ABC is an isosceles triangle, in which AB = AC, circumscribed about a circle. Show that BC is bisected at the point of contract. **(CBSE 2008-2M)**

20. Two concentric circles of radius r and 7 cm respectively where r>7. A chord of larger circle of length 48 cm touches the smaller circle. Find value of r. **(CBSE 2011-2M)**

21. Prove that line segment joining two point of contacts of two parallel tangents of a circle passes through its centre.**(CBSE 2014-2M)**

22. If from an external point P of a circle with centre O, two tangents PQ and PR are drawn such that $\angle QPR=120^0$, prove that 2PQ=PO. **(CBSE 2014-2M)**

23. Prove that the tangents drawn at the end points of a chord of a circle make equal angles with the chord. **(CBSE 2017-2M)**

24. A circle touches all the four sides of a quadrilateral ABCD. Prove that AB + CD = BC + DA. **(CBSE 2017-2M)**

25. If all the sides of a parallelogram touch a circle show that the parallelogram is a rhombus. **(CBSE 2010 & 2013-2M)**

26. In Fig. 5, a circle is inscribed in a quadrilateral ABCD in which $\angle B = 90^0$. If AD = 23 cm, AB = 29 cm and DS = 5 cm, find the radius (r) of the circle. **(CBSE 2008-2M)**

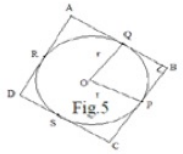
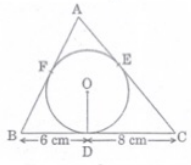
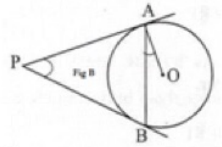


Fig.5

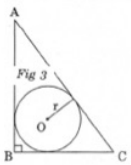
27. In fig 2, triangle ABC is drawn circumscribing a circle of radius 3 cm, such that segments BD and DC into which BC is divided by the point of contact D are of lengths 6 cm and 8 cm respectively. Find side AB if the area of triangle ABC is 63 cm^2. **(CBSE 2010-2M)**



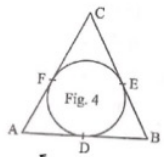
28. In fig B, two tangents PA and PB are drawn to a circle with centre O from an external point P. Prove that angle APB = 2 angle OAB.
(CBSE 2009-2M)



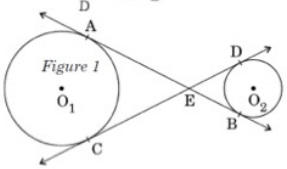
29. In fig 3, right triangle ABC, circumscribes a circle of radius r. If AB and BC are of lengths 8 cm and 6 cm respectively. Find value of r. **(CBSE 2012-2M)**



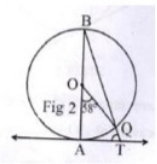
30. In fig 4, AB=12 cm, BC=8 cm & AC=10 cm then find lengths of AD, BE and CF. **(CBSE 2013-2M)**



31. In fig 1, common tangents AB and CD to the two circles with centres O_1 and O_2 intersect at E. Prove that AB=CD. **(CBSE 2014-2M)**



32. In fig2, AB is diameter of circle with centre O and AT is a tangent. If $\angle AOQ=58^0$, find $\angle ATQ$. **(CBSE 2015-2M)**



33. In fig2, prove that AB+CD=BC+DA. **(CBSE 2016-2M)**

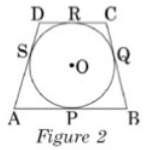


Figure 2

34. In fig3, radius of circle is r. If OP=2r show that $\angle OTS=\angle OST=30^0$. **(CBSE 2016-2M)**

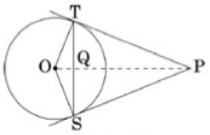
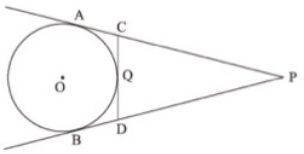


Figure 3

35. In the given figure, PA and PB are tangents to the circle from an external point P. CD is another tangent touching the circle at Q. If PA =12 cm, QC = QD = 3 cm, then find PC + PD. **(CBSE 2017-2M)**



36. Prove that tangents drawn at the end of diameter of a circle are parallel to each other. **(CBSE 2012, 2017-2M)**

37. The in-circle of an isosceles triangle ABC, in which AB = AC, touches the sides BC, CA and AB at D, E and F respectively. Prove that BD = DC. **(CBSE 2014-2M)**

38. In fig 2, TA is a tangent to the circle from a point T and TBC is a secant to the circle. If AD is the bisector of $\angle CAB$, prove that ΔADT is isosceles. **(CBSE 2007-3M)**

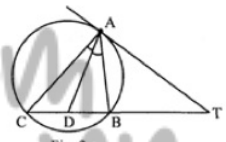


Fig. 2

39. In fig 4, triangle ABC is drawn circumscribing a circle of radius 10 cm, such that segments BD and DC into which BC is divided by the point of contact D are of lengths 15 cm and 20 cm respectively. Find side AB & AC if the area of triangle ABC is 525 cm^2. **(CBSE 2011-3M)**

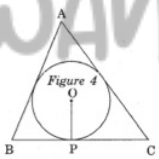
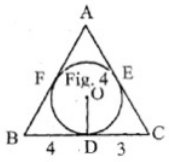


Figure 4

40. In fig 4, triangle ABC is drawn circumscribing a circle of radius 2 cm, such that segments BD and DC into which BC is divided by the point of contact D are of lengths 4 cm and 3 cm respectively. Find side AB if the area of triangle ABC is 21 cm^2. **(CBSE 2011-2M)**



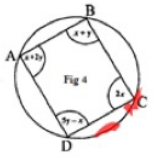
41. In ABC, $AD \perp BC$ and AD^2 = BD.DC. Prove that BAC is a right angle. **(CBSE 2007-3M)**

42. Two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that $\angle PTQ = 2\angle OPQ$. **(CBSE 2017-3M)**

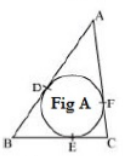
43. Prove that the lengths of the tangents drawn from an external point to a circle are equal. **(CBSE 2011 & 2012-4M, 2018-2M)**

44. Prove that tangent at any point of a circle is perpendicular to the radius at the point of contact. **(CBSE 2013-4M)**

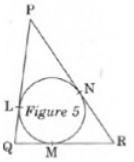
45. Prove that the sum of either pair of opposite angles of a cyclic quadrilateral is 180°.Using the above, find x and y in Fig. 4. **(CBSE 2007-5M)**



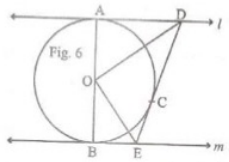
46. In figure A, a circle is inscribed in a triangle ABC having side BC = 8 cm, AC = 10 cm and AB = 12 cm. Find AD, BE and CF.
(CBSE 2009-3M)



47. In fig 5, a circle is inscribed in a triangle PQR with PQ=10 cm, QR=8 cm & PR=12 cm. Find lengths of QM, RN and PL. **(CBSE 2012-3M)**



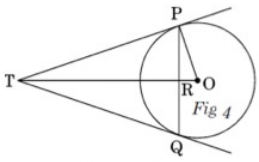
48. In fig 6, l and m are two parallel tangents to a circle with centre O touching the circle at A and B respectively. Another tangent at C intersects the line l at D and m at E. Prove that angle DOE is 90^0. **(CBSE 2013-4M)**



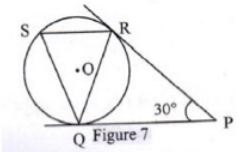
49. Prove that the lengths of the tangents drawn from an external point to a circle are equal. Using the above theorem prove that: If quadrilateral ABCD is circumscribing a circle, then AB + CD = AD + BC. **(CBSE 2009-6M)**

50. Prove that the tangent at any point of a circle is perpendicular to the radius through the point of contact. **(CBSE 2014, 2015-4M)**

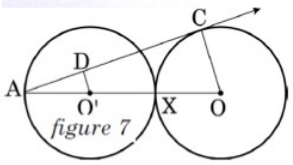
51. In Figure 4, PQ is a chord of length 16 cm, of a circle of radius 10 cm. The tangents at P and Q intersect at a point T. Find the length of TP.
(CBSE 2014-4M)



52. In fig7, $\angle RPQ=30^0$ & RS is parallel to PQ then, find $\angle RQS$.
(CBSE 2015-4M)



53. In fig7, two equal circles with centres O and O' touch each other at X. OO' produced meets the circles with centre O' at A. AC is tangent to the circle with centre O, at the point C. O'D is perpendicular to AC. Find the value of DO'/CO. **(CBSE 2016-4M)**



Constructions

Tangent
2009, 2010, 2013, 2015, 2016, 2016, 2017

Divide line Segment
2011

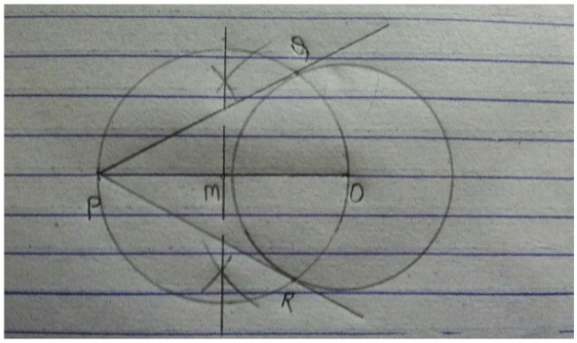
Questions

[Tangent]

Q. Draw a circle of radius 3 cm. From a point P, 6 cm away from its centre, construct a pair of tangents to the circle. Measure the lengths of the tangents. **(CBSE 2009-3M)**

Ans - 1. Draw a circle of radius 3cm with centre O.
2. A point P was marked outside the circle such that, OP = 6cm.
3. P to O was joined.
4. Perpendicular bisector of PO was found to be M.
5. With MO as radius and M as center a circle was drawn touching the previous drawn circle.
6. Points of intersections of two circles were marked to be Q and R respectively.
7. P was joined to Q and R respectively.
Therefore, required tangents will be PQ and PR.

Calculation:
In ΔPQO, if <Q= 90° then,
PO x PO = PQ x PQ + QP x QP
=> PO x PO - QP x QP = PQ x PQ
=> 6 x 6 - 3 x 3 = PQ x PQ
=> 36 - 9 = PQ x PQ
=> √27 = PQ
=> 3√3 cm = PQ
Hence, the length of both tangents which are here equal to 3√3cm.



Q. Draw a circle of radius 3 cm. From a point P, 7 cm away from its centre, construct a pair of tangents to the circle. Also, measure the lengths of the tangents. **(CBSE 2010-3M)**
Q. Draw two concentric circles of radii 2 cm and 5 cm. Taking a point on outer circle, construct the pair of tangents to the other. Also, measure the length of tangent. **(CBSE 2013-3M)**

Q. Draw a circle of radius 3 cm. From a point P, 7 cm away from its centre, construct a pair of tangents to the circle. Measure the lengths of the tangents. **(CBSE 2015-4M)**

Q. Draw two concentric circles of radii 3 cm and 5 cm. Construct tangent to smaller circle from a point on larger circle. Also, measure the length of tangent. **(CBSE 2016, 2017-4M)**

Q. Draw a circle of radius 4 cm. Draw tangents to the circle inclined at angle of 60^0 to each other. **(CBSE 2016-4M)**

Q. Draw a line segment AB of length 7cm. Taking A as centre, draw a circle of radius 3cm and taking B as centre, draw another circle of radius 2 cm. Construct tangents to each circle from the centre of the other circle. **CBSE 2020**

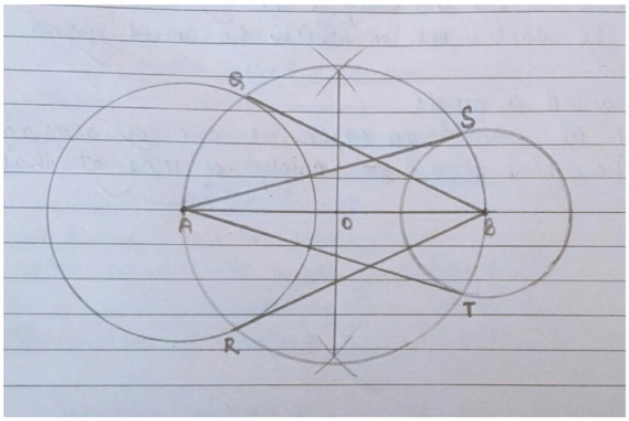
[Divide Line Segment]

Q. Draw a line segment AB of length 7 cm. Taking A as centre, draw a circle of radius 3 cm and taking B as centre, draw another circle of radius 2 cm. Construct tangents to each circle from the centre of the other circle. **(CBSE 2011-3M)**

The construction of the given situation is attached alongwith this answer.

⋆ Steps Of Construction⋆

1. Take AB = 7 cm.
2. With A as centre and 3 cm as radius, draw a circle.
3. Similarly, with B as centre and 2 cm as radius, draw a circle.
4. Now, draw the perpendicular bisector of AB and mark the point of intersection O.
5. With O as centre and OA as radius, draw a circle. Mark the 2 points where the circles with centre O and A meet as Q and R. Similarly, mark the points where the circles with centres O and B meet as S and T respectively.
6. Join BR and BQ as well as AS and AT. Now, BR, BQ, AS and AT are the required tangents.



Areas Related to Circles AND Surface Areas and Volumes

Questions

[Trapezium]

Q. Sudhakar donated 3 cylindrical drums to store cereals to an orphanage. If radius of each drum is 0.7 m and height 2 m, find the volume of each drum. If each drum costs Rs.350 per m^3, find the amount spent by Sudhakar for orphanage. What value is exhibited in the question? (Use $\pi = 22/7$) **CBSE 2018-4M**

Ans- Given,radius of the drum:0.7m

Height:2m

Volume of the cylinder: 22/7r²h

On substituting the given value:

→22/7x0.7x0.7x2

=3.08m^3

For 3 cylinders=3x3.08

→9.24m^3

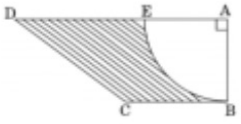
Cost=350per m^3

→ 350x9.24

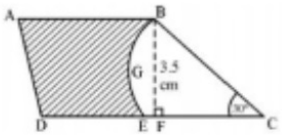
→3234.00

Total amount spent by him=3234

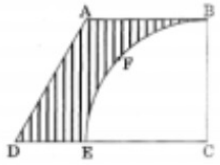
In Figure 3, ABCD is a trapezium of area 24.5 sq. cm. In it, AD || BC, $\angle DAB = 90^0$, AD = 10 cm and BC = 4 cm. If ABE is a quadrant of a circle, find the area of the shaded region. (Use $\pi = \frac{22}{7}$) **CBSE2014-3M**



In Fig. 4, ABCD is a trapezium with AB || DC and $\angle BCD = 30^0$. If BGEC is a sector of a circle with centre C and AB = BC = 7 cm, DE = 4 cm and BF = 3.5 cm, then find the area of the shaded region. (Use $\pi = \frac{22}{7}$) **CBSE2017-3M**



From a thin metallic sheet a trapezium ABCD in which AB is parallel to CD and $\angle BCD = 90^0$, a quarter circle BFEC is removed. Given AB=BC= 3.5 cm, and DE= 2 cm, find the area of the remaining portion of metallic sheet. (Use $\pi = \frac{22}{7}$)



CBSE2011-4M

[MELTED]

Q. 504 cones, each of diameter 3.5 cm and height 3 cm, are melted and recast into a metallic sphere. Find the diameter of the sphere and hence find its surface area. (use pi=22/7)
CBSE2015-3M

Ans -diameter of cone = 3.5 cm and height = 3 cm

Volume of cone = $\frac{1}{3} * \pi * r^2 h$

$= \frac{1}{3} * \frac{22}{7} * \frac{3.5}{2} * \frac{3.5}{2} * 3$

$= \frac{77}{8}$

Volume of 505 cones = 504 * 77/8 = 4851 cu cm

These cones are melted and made into a sphere.

Volume of sphere = 4851 cu cm

$\frac{4}{3} * \pi * r^3 = 4851$

$\frac{4}{3} * \frac{22}{7} * r^3 = 4851$

$r^3 = 1157.625$

r = 10.5 cm

Diameter = 21 cm

Total surface area of sphere = 4 * π * r^2

TSA = 4 * 22/7 * 10.5 * 10.5 = 1386 sq cm

Q. The dimensions of a solid iron cuboid are 4·4 m × 2·6 m × 1·0 m. It is melted and recast into a hollow cylindrical pipe of 30 cm inner radius and thickness 5 cm. Find the length of the pipe. **CBSE2017-3M**

Q. The diameters of the internal and external surfaces of a hollow spherical shell are 6 cm and 10 cm respectively. It is melted and recast into a solid cylinder of diameter 14 cm, find the height of the cylinder. **CBSE2018-3M**

Q. A solid right circular cone of diameter 14 cm and height 8 cm is melted to form a hollow sphere. If the external diameter of the sphere is 10 cm, find the internal diameter of the sphere.
CBSE2007-4M

Q. A solid metallic cylinder of diameter 12 cm and height 15 cm is melted and recast into toys each in the shape of a cone of radius 3 cm and height 9 cm. Find the number of toys so formed. **CBSE2017-4M**

[Volume of cylinder]

Q. The slant height of a frustum of a cone is 4 cm and the perimeters (circumferences) of its circular ends are 18 cm and 6 cm. Find the curved surface area of the frustum.(use pi=22/7)
CBSE2010-1M

Ans- Given slant height(l)=4cm

Circumference1(C1)=18cm

2 pie r1 = 18cm

2*22/7*r1 = 18cm

therefore, r1 = 63/22cm

similarly, C2 = 6cm

so, r2 = 21/22cm

now CSA of frustum of cone = pie l (r1+r2)

22/7*4(63/22+21/22)

84/22 * 4 * 22/7

=48 sq. cm

Q. A sphere of diameter 18 cm is dropped into cylindrical vessel of diameter 36 cm, partly filled with water. If the sphere is completely submerged then find the rise in water level. **CBSE2011-1M**

Q. If the radius of the base of right circular cylinder is halved, keeping the height same, then find the ratio of the volume of the cylinder thus obtained to the volume of the original cylinder. **CBSE2012-1M**

Q. The sum of the radius of base and height of a solid right circular cylinder is 37 cm. If the total surface area of the solid cylinder is 1628 sq. cm, find the volume of the cylinder. (Use $\pi = 22/7$) **CBSE2016-3M**

Q. From a solid cylinder whose height is 8 cm and radius 6 cm, a conical cavity of same height and same base radius is hollowed out. Find the total surface area of the remaining solid. (Use $\pi = 3.14$) **CBSE2017-3M**

Q. From a solid cylinder whose height is 8 cm and radius 6 cm, a conical cavity of height 8 cm and of base radius 6 cm, is hollowed out. Find the volume of the remaining solid correct to two places of decimals. Also find the total surface area of the remaining solid. $\pi = 3.1416$ **CBSE2009-4M**

Q. In a rain-water harvesting system, the rain-water from a roof of 22 m × 20 m drains into a cylindrical tank having diameter of base 2 m and height 3·5 m. If the tank is full, find the rainfall in cm. Write your views on water conservation. **CBSE2017-4M**

Q. A well of diameter 4 m is dug 21 m deep. The earth taken out of it has been spread evenly all around it in the shape of a circular ring of width 3 m to form an embankment. Find the height of the embankment. **CBSE2016-3M**

[Cone]

Q. A conical vessel, with base radius 5 cm and height 24 cm, is full of water. This water is emptied into a cylindrical vessel of base radius 10 cm. Find the height to which the water will rise in the cylindrical vessel. **CBSE2016-3M**

Ans- Internal radius of conical vessel = 5 cm

Height = 24 cm

Since the conical vessel is full of water, so volume of water = volume of vessel

So, volume of water = 13πr2h = 13×227×52×24 = 44007 cm3

Now, this volume of water is emptied in a cylindrical vessel.

So, suppose the height of level of water in the cylindrical vessel is h.

and radius of base of cylindrical vessel = 10 cm

So, volume of water in cylindrical vessel up to height h = π×102×h = 44007 cm3

⇒227×100×h = 44007⇒h = 440022×100 = 2

Therefore, height of water level in cylindrical vessel = 2 cm

Q. A heap of rice is in the form of a cone of base diameter 24 m and height 3.5 m. Find the volume of the rice. How much canvas cloth is required to just cover the heap? **CBSE2018-3M**

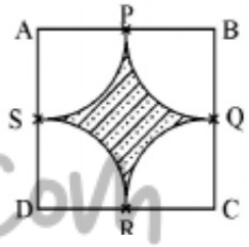
Q. A solid is in the shape of cone surmounted on a hemisphere, the radius of each of them being 3.5 cm, total height of solid is 9.5 cm. Find the volume of the solid. **CBSE2012-4M**

Two cones have their heights in the ratio 1:3 and radii in the ratio 3:1. What is the ratio of their volumes? **CBSE 2020**

Q. A cone of base radius 4cm is divided into two parts by drawing a plane through the midpoint of its height and parallel and parallel to its base. Compare the volumes of the two parts.

[Quadrant]

Find the area of the shaded region in Fig. 2, where arcs drawn with centres A, B, C and D intersect in pairs at mid-points P, Q, R and S of the sides AB, BC, CD and DA respectively of a square ABCD of side 12 cm. [Use π= 3.14] **CBSE2018-3M**



[Volume of sphere and hemisphere]

Q. A sphere of diameter 18 cm is dropped into cylindrical vessel of diameter 36 cm, partly filled with water. If the sphere is completely submerged then find the rise in water level. **CBSE2011-1M**

Ans - Step-by-step explanation:

$$Diameter\ of\ a\ Sphere(d) = 18\ cm$$

$$Radius\ of\ the\ Sphere(r) = \frac{d}{2}$$
$$= \frac{18}{2} = 9\ cm$$

$$Diameter\ of\ a\ cylinderical\ vessel(D) = 36\ cm$$

$$Radius\ the\ vessel(R) = \frac{D}{2}$$
$$= \frac{36}{2}$$
$$= 18\ cm$$

According to the problem given

If the sphere dropped into the cylindrical vessel partly filled with water if the Sphere is completely submerged ,

$$Let\ the\ water\ level\ rises = H\ cm$$

$$Volume\ of\ the\ vessel = Volume\ of\ the\ sphere$$

$$\implies \pi R^2 H = \frac{4}{3}\pi r^3$$

$$\implies H = \frac{\frac{4}{3}\pi r^3}{\pi R^2}$$

$= \frac{4 \times r^3}{3 \times R^2}$
$= \frac{4 \times 9^3}{3 \times 18^2}$
$= \frac{4 \times 9 \times 9 \times 9}{3 \times 18 \times 18}$
$= 3\ cm$

Therefore.,

$Rised\ water\ level = 3\ cm$

Q. The volume of a hemisphere is 2425 ½ cm^3. Find its curved surface area.**CBSE2012-2M**

Q. Two circular pieces of equal radii and maximum area, touching each other are cut from a rectangular card board of dimensions 14 cm by 7 cm. Find the area of remaining card board.**CBSE2013-2M**

Q. If the total surface area of a solid hemisphere is 462 cm^2, find its volume. **CBSE2014-2M**

Q. The largest possible sphere is carved out of a wooden solid cube of side 7 cm. Find the volume of the wood left. **CBSE2014-3M**

Q. A hemispherical bowl of internal diameter 36 cm contains liquid. This liquid is filled into 72 cylindrical bottles of diameter 6 cm. Find the height of the each bottle, if 10% liquid is wasted in this transfer. **CBSE2015-3M**

Q. A sphere of diameter 12 cm is dropped in a right circular cylindrical vessel, partly filled with water. If the sphere is completely submerged in water, the water level in the vessel rises by $3\frac{5}{9}$ *cm* . Find the diameter of the cylindrical vessel. **CBSE2018-3M**

Q. A hollow sphere of internal and external diameters 4 cm and 8 cm respectively is melted to form a cone of base diameter 8 cm. Find the height and slant height of the cone. **CBSE2011-4M**

[Area of Circle]

Q. If the area of a circle is equal to the area of two circles of radii 3 cm and 4 cm then find the radius of the larger circle. **CBSE2011-1M**

Ans - πr^2 = 3.14 * 3*3 = 28.6

πr^2 = 3.14 * 4*4 = 50.24

Total area = 50.24 +28.6 = 78.5

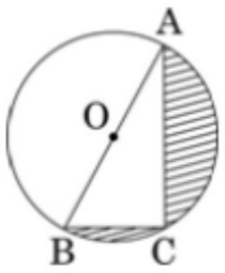
Bigger circle area = πr^2 = 78.5

r^2 = 78.5 /3.14= 25

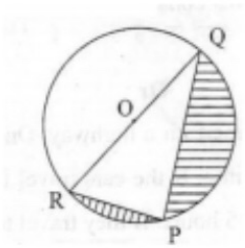
Then r = √ 25 = 5cm

Q. If the area of a circle is equal to area of two circles of diameters 10 cm and 24 cm then find the diameter of the larger circle. **CBSE2012-1M**

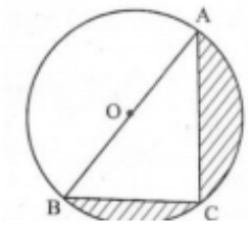
In fig.4, O is the centre of a circle such that diameter AB=13 cm and AC=12 cm. BC is joined. Find the area of the shaded region. (Take π=3.14) **CBSE2016-3M**



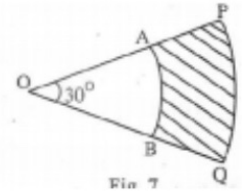
In Fig, PQ = 24 cm, PR = 7 cm and 0 is the centre of the circle. Find the area of shaded region (take π = 3 .14) **CBSE2009-3M**



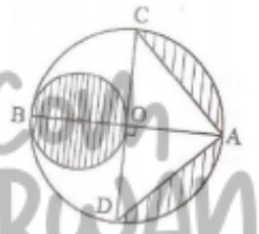
Find the area of the shaded region in Fig. , if AC = 24 cm, BC = 10 cm and 0 is the centre of the circle.
[Use $\pi = 3.14$] **CBSE2010-3M**



In fig, PQ and AB are respectively arcs of two concentric circles of radius 7 cm and 3.5 cm with centre O. If $\angle POQ = 30^0$, find the area of shaded region. **CBSE2012-3M**

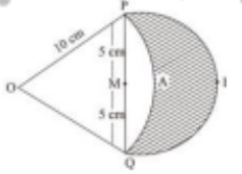


In fig, AB and CD are two diameters of circles with centre O, which are perpendicular to each other. OB is the diameter of smaller circle. If OA=7cm, find the area of shaded region. **CBSE2013-3M**

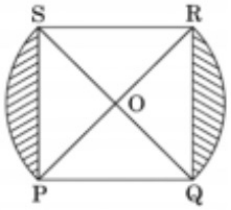


In Fig. 7, are shown two arcs PAQ and PBQ. Arc PAQ is a part of circle with centre O and radius OP while arc PBQ is a semi-circle drawn on PQ as diameter with centre M. If OP = PQ = 10 cm show that area of shaded region is $25(\sqrt{3} - \frac{\pi}{6})\ cm^2$.

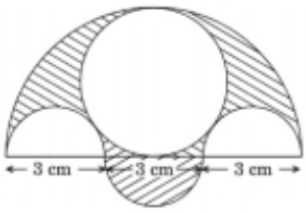
CBSE2016-3M



In Figure 5, PQRS is a square lawn with side PQ = 42 metres. Two circular flower beds are there on the sides PS and QR with centre at O, the intersection of its diagonals. Find the total area of the two flower beds (shaded parts). **CBSE2015-4M**



Three semicircles each of diameter 3 cm, a circle of diameter 4·5 cm and a semicircle of radius 4·5 cm are drawn in the given figure. Find the area of the shaded region. **CBSE2017-3M**



[Sector]

Q. A chord of a circle of radius 10 cm subtends a right angle at its centre. Find the length of the chord (in cm). **CBSE2014-1M**

Ans- Let the circle's radius be 'r' and the angle that is subtended at the center by the chord be ∅,

We are given that:

r = 10cm

∅ = 90°

Length of the chord = 2r sin ∅/2

= 2 * 10sin (90°/2)

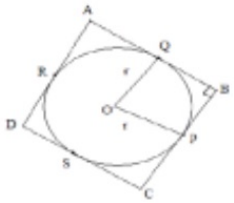
= 20 * sin 45°

= 20 * $1/\sqrt{2}$

= $10\sqrt{2}$

In cm, it would be 14.14 cm

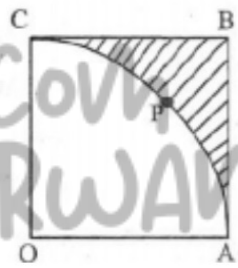
In Fig, a circle is inscribed in a quadrilateral ABCD in which $\angle B = 90^0$. If AD = 23 cm, AB = 29 cm and DS = 5 cm, find the radius (r) of the circle. **CBSE2008-2M**



Find the area of a quadrant of a circle whose circumference is 44 cm. **CBSE2011-2M**

In fig, OABC is a square of side 7 cm. If OAPC is quadrant of a circle with centre O, find the area of shaded region.

(Use $\pi = \frac{22}{7}$) **CBSE2013-2M**



Q. Find the area of major segment in the figure where radius of circle is 35 cm and $\angle AOB$ = 90^0.(Use π = 22) **CBSE2011-3M**

In fig, PQ and AB are respectively arcs of two concentric circles of radius 7 cm and 3.5 cm with centre O. If $\angle POQ = 30^0$, find the area of shaded region. **CBSE2012-3M**

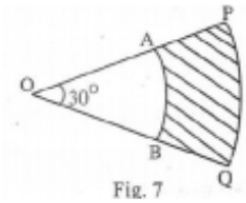
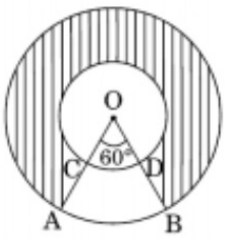
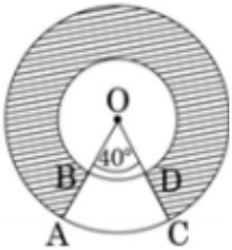


Fig. 7

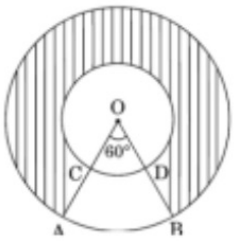
In Figure 2, two concentric circles with centre O, have radii 21 cm and 42 cm. If $\angle AOB = 60^0$ find the area of the shaded region. (Use $\pi = \frac{22}{7}$) **CBSE2014-3M**



In fig. 6, find the area of the shaded region, enclosed between two concentric circles of radii 7 cm and 14 cm where $\angle AOC = 40^0$. **CBSE2016-3M**



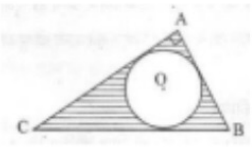
In the given figure, two concentric circles with centre O have radii 21 cm and 42 cm. If $\angle AOB = 60^0$, find the area of the shaded region. (Use $\pi = \frac{22}{7}$) **CBSE2017-3M**



Q. A chord of a circle, of radius 15 cm, subtends an angle of 60^0 at the centre of the circle. Find the area of major and minor segments (Take π= 3.14, 3 = 1.73) **CBSE2018-3M**

Q. In a circle of radius 21 cm, an arc subtends an angle of 60º at the centre. Find (i) the length of the arc and (ii) area of sector formed by the arc. **CBSE2018-3M**

In Fig, ABC is a right triangle right angled at A. Find the area of shaded region if AB = 6 cm, BC = 10 cm and 0 is the centre of the in-circle of *triangle ABC*.
($\pi = 3.14$)**CBSE2009-4M**



[Volume of cube and cuboid]

Q. Two cubes have their volumes in the ratio 1: 27. Find the ratio of their surface areas. **CBSE2018-1M**

Ans - Let their edges be a and b.

Then,

$a^3/b^3 = 1/27$

$\Rightarrow (a/b)^3 = (1/3)^3$

$\Rightarrow a/b = 1/3$ ---------- (1)

Therefore, Ratio of the surface area,

$\Rightarrow 6a^2/6b^2$

$\Rightarrow a^2/b^2$

$\Rightarrow (a/b)^2$

$\Rightarrow (1/3)^2$ [From (1)]

$\Rightarrow 1/9$

Ratio of the surface area = 1 : 9

Q. Water in a canal, 6 m wide and 1.5 m deep, is flowing at a speed of 4 km/h. How much area will it irrigate in 10 minutes, if 8 cm of standing water is needed for irrigation? **CBSE2014-3M**

Q. Water in a canal, 5·4 m wide and 1·8 m deep, is flowing with a speed of 25 km/hour. How much area can it irrigate in 40 minutes, if 10 cm of standing water is required for irrigation? **CBSE2017-3M**

Q. Water in a canal 6 m wide and 1.5 m deep, is flowing with a speed of 10 km/h. How much area will it irrigate in 30 minutes, if 8 cm of standing water is needed for irrigation? **CBSE2017-3M**

Q. A farmer connects a pipe of internal diameter 20 cm from a canal into a cylindrical tank in his field which is 10 m in diameter and 2 m deep. If water flows through the pipe at the rate of 6 km/h., in how much time will the tank be filled? **CBSE2008-4M**

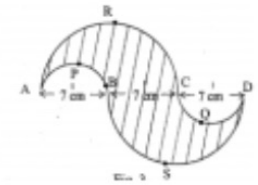
Q. Water is flowing at the rate of 6km/h through a pipe of diameter 14 cm into rectangular tank of dimensions 60 m long and 22 m wide. Determine the time in which the level of water in tank will rise by 7 cm.**CBSE2011-4M**

Q. Water is flowing through a cylindrical pipe of inner diameter 2cm, into a cylindrical tank of base radius 40 cm, at the rate of 0.4 m/s. Determine the raise in the water level in the tank in half an hour. **CBSE2013-4M**

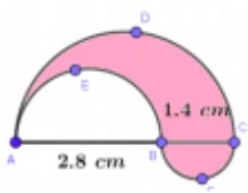
[Area + Perimeter of cube]

In fig, APB and CQD are semi-circles with diameter 7 cm each, while ARC and BSD are semi-circles with diameter 14 cm each. Find the perimeter of shaded region. **CBSE2011-2M**

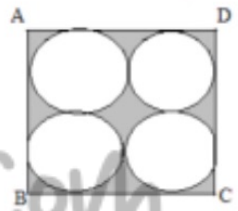
$\pi = \frac{22}{7}$



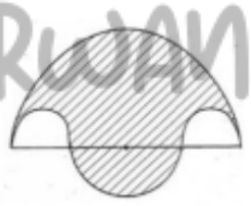
In Fig., find the perimeter of shaded region where ADC, AEB and BFC are semicircles on diameters AC, AB and BC respectively. **CBSE2008-3M**



Find the area of the shaded region in Fig., where ABCD is square of side 14 cm. **CBSE2008-3M**



In Fig., the boundary of shaded region consists of four semicircular arcs, two smallest being equal. If diameter of the .largest is 14 cm and that of the smallest is 3.5 cm, calculate the area of the shaded region. (Use $\pi = \frac{22}{7}$) **CBSE2010-3M**



[Surface area of cube, cuboid, cylinder]

Q. Two cubes, of side 4 cm are joined to each other side by side. Find the surface area of the resulting cuboid. **CBSE2011-2M**

Ans - two cubes are joined end to end
means
breadth=4cm no change
height=4cm. no change
but
length= 4cm + 4cm 8cm

put all the values in the formulae

AREA OF CUBOID = 2(L×B+B×H+H×L)
AREA OF CUBOID = 2(8×4+4×4+4×8)
AREA OF CUBOID = 2(80)
AREA OF CUBOID = 160cm^2

Q. Two cubes have their volumes in the ratio 1: 27. Find the ratio of their surface areas. **CBSE2018-1M**

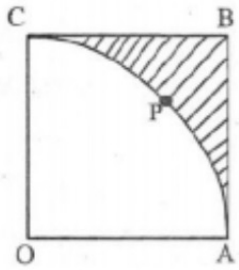
Q. From a solid cylinder of height 7 cm and base diameter of 12 cm, a conical cavity of same height and same base diameter is hollowed out. Find the total surface area of the remaining solid. **CBSE2012-3M**

Q. The sum of the radius of base and height of a solid right circular cylinder is 37 cm. If the total surface area of the solid cylinder is 1628 sq. cm, find the volume of the Cylinder. **CBSE2016-3M**

[Length of Arc]

In fig, OABC is a square of side 7 cm. If OAPC is quadrant of a circle with centre O, find the area of shaded region.

(Use $\pi = \frac{22}{7}$) **CBSE2013-2M**



Q. A solid right circular cone of diameter 14 cm and height 8 cm is melted to form a hollow sphere. If the external diameter of the sphere is 10 cm, find the internal diameter of the sphere. **CBSE2007-4M**

Ans- Diameter of cone=14 cm

so, Radius of cone= 7cm

Height of cone= 8cm

∴ Volume of cone= 1/3*pi*r^2*h

=1/3*pi*49*8 cm^3

In Sphere, External Radius R=5cm

Let, Internal Radius = r

Volume of Sphere = External Volume- Internal Volume

= 4/3*pi*R^3-4/3*pi*r^3

=4/3*pi[R^3-r^3]

=4/3*pi[5^3-r^3]

But During Conversion Volume Remains Same

So, Volume of Sphere=Volume of Cone

4/3*pi[125-r^3]= 1/3*pi*49*8

4[125-r^3]=49*8

[125-r^3]=49*2

r^3=125-98

r^3=27

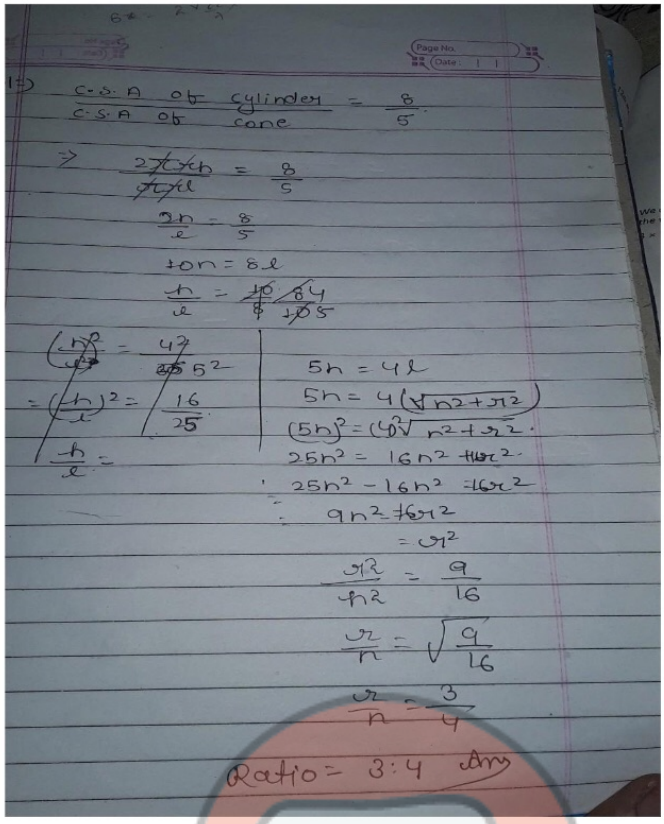
so, r =3 cm

Internal Radius= 3cm

So, Internal Diameter=3*2= 6cm

[Combination of solids]

Q. A right circular cylinder and a cone have equal bases and equal heights. If their curved surface areas are in the ratio 8: 5, show that the ratio between radius of their bases to their height is 3: 4. **CBSE2018-2M**



Q. A vessel is in the form of a hemispherical bowl surmounted by hollow cylinder of same diameter. The diameter of hemi spherical bowl is 14 cm and total height of vessel is 13 cm. Find the total surface area of the vessel. (Use $\pi = \frac{22}{7}$) **CBSE2013-3M**

Q. A wooden toy was made by scooping out a hemisphere of same radius from each end of a solid cylinder. If the height of the cylinder is 10 cm, and its base radius is 3.5 cm, find the volume of the wood in the toy. (Use $\pi = \frac{22}{7}$) **CBSE2013-3M**

Q. Due to sudden floods, some welfare associations jointly requested the government to get 100 tents fixed immediately and offered to contribute 50% of the cost. If the lower part of each tent is of the form of a cylinder of diameter 4.2 m and height 4 m with the conical upper part of same diameter but of height 2.8 m, and the canvas to be used costs Rs. 100 per sq. m, find the amount, the associations will have to pay. What values are shown by these associations? (Use $\pi = \frac{22}{7}$) **CBSE2015-3M**

Q. A cubical block of side 10 cm is surmounted by a hemisphere. What is the largest diameter that the hemisphere can have? Find the cost of painting the total surface area of the solid so formed, at the rate of Rs. 5 per 100 sq. cm. (Use $\pi = 3.14$)

CBSE2015-3M

Q. A sphere of diameter 12 cm, is dropped in a right circular cylindrical vessel, partly filled with water. If the sphere is completely submerged in water, the water level in the cylindrical vessel rises by $3\frac{5}{9}$ cm. Find the diameter of the cylindrical vessel.

CBSE2016-3M

Q. A sphere of diameter 12 cm, is dropped in a right circular cylindrical vessel, partly filled with water. If the sphere is completely submerged in water, the water level in the cylindrical vessel rises by $3\frac{5}{9}$ cm. Find the diameter of the cylindrical vessel.

CBSE2018-3M

Q. A cylinder whose height is two-third of its diameter, has the same volume as that of a sphere of radius 4 cm. Find the radius of base of the cylinder. **CBSE2018-3M**

Q. A sphere, of diameter 12 cm, is dropped in a right circular cylindrical vessel, partly filled with water. If the sphere is completely submerged in water, the water level in the cylindrical vessel rises by $3\frac{5}{9}$ cm. Find the diameter of the cylindrical vessel. **CBSE2007-4M**

Q. A toy is in the form of a. hemisphere surmounted by a right circular cone of the same base radius as that of the hemisphere. If the radius of base of cone is 21 cm and its volume is two third of the volume of the hemisphere, calculate the height of the cone and the surface area of the toy. **CBSE2010-4M**

1Q. 50 spherical marbles, each of diameter 1.4 cm, are dropped in a cylindrical vessel of diameter 7 cm containing some water, which are completely immersed in water. Find the rise in the level of water in the vessel. **CBSE2014-4M**

Q. From each end of a solid metal cylinder, metal was scooped out in hemispherical form of the same diameter. The height of the cylinder is 10 cm and its base is of radius 4.2 cm. The rest of the cylinder is melted and converted into a cylindrical wire of 1.4 cm thickness. Find the length of the wire. **CBSE2015-4M**

Q. Due to heavy floods in a state, thousands were rendered homeless. 50 schools collectively offered to the state government to provide a place and the canvas for 1500 tents to be fixed by the government and decided to share the whole expenditure equally. The lower part of each tent is cylindrical of base radius 2.8 m and height 3.5 m, with conical upper part of same base radius but of height 2.1 m. If the canvas used to make the tents costs Rs.120 per sq.m, find the amount shared by each school to set up the tents. What value is generated by the above problem? **CBSE2016-4M**

Statistics

Write the median class of the following distribution : **CBSE2009-1M**

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	4	4	8	10	12	8	4

The mean of the following frequency distribution is 62.8. Find the missing frequency *x*. **CBSE2007-2M**

Class	0-20	20-40	40-60	60-80	80-100	100-120
Frequency	5	8	x	12	7	8

The enrolment of a secondary school in different classes is given below: **CBSE2007-3M**

Class	VI	VII	VIII	IX	X
Enrolment	600	500	400	700	200

Draw a pie chart to represent the above data.

The table below shows the salaries of 280 persons : **CBSE2018-3M**

Salary (in Thousand Rs.)	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50
No. of Persons	49	133	63	15	6	7	4	2	1

Calculate the median salary of the data.

The following distribution gives the daily income of 50 workers of a factory :

Daily income (in Rs.)	100-120	120-140	140-160	160-180	180-200
No.of Workers	12	14	8	6	10

Find the mean and mode of the above data. **CBSE2018-3M**

By changing the following frequency distribution 'to less than type' distribution, draw its ogive. **CBSE2018-3M**

Class	0-15	15-30	30-45	45-60	60-75
Frequency	6	8	10	6	4

Find the median of the following distribution : **CBSE2018-3M**

Class	0-10	10-20	20-30	30-40	40-50
Frequency	8	12	10	11	9

100 surnames were randomly picked up from a local telephone directory and the distribution of number of letters of the English alphabet in the surnames was obtained as follows: **CBSE2008-4M**

No.of Letters	1-4	4-7	7-10	10-13	13-16	16-19
No.of Surnames	6	30	40	16	4	4

Determine the median and mean number of letters in the surnames. Also find the modal size of surnames.

The following table gives the daily income of 50 workers of a factory : **CBSE2009-4M**

Daily income (in Rs.)	100-120	120-140	140-160	160-180	180-200
No.of Workers	12	14	8	6	10

Find the mean, median and mode of the data.

During the medical check-up of 35 students of a class their weights were recorded as follows : **CBSE2009-4M**

Weight (in kg)	38-40	40-42	42-44	44-46	46-48	48-50	50-52
No.of Students	3	2	4	5	14	4	3

Draw a less than type and a more than type ogive from the given data. Hence obtain the median weight from the graph.

Find the mean, median and mode of the data.: **CBSE2010-4M**

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	4	4	7	10	12	8	5

If the mean of the following frequency distribution is 65.6. Find the missing frequencies f_1 and f_2. **CBSE2010-4M**

Class	10-30	30-50	50-70	70-90	90-110	110-130
Frequency	5	8	f_1	20	f_2	2

The mean of the following distribution is 18. Find the frequency f of the class 19 – 21. **CBSE2018-4M**

Class	11-13	13-15	15-17	17-19	19-21	21-23	23-25
Frequency	3	6	9	13	f	5	4

The following distribution gives the daily income of 50 workers of a factory :

Daily income (in Rs.)	100-120	120-140	140-160	160-180	180-200
No.of Workers	12	14	8	6	10

Convert the distribution above to a less than type cumulative frequency distribution and draw its ogive. **CBSE2018-4M**

The median of the following data is 52.5. If the total frequency is 100, find the values of x and y. **CBSE2018-4M**

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Freq	2	5	x	12	17	20	y	9	7	4

Find the mean and mode for the following data : **CBSE2018-4M**

Class	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Freq	4	8	10	12	10	4	2

If the mean of the following frequency distribution is 62.8. Find the missing frequencies f_1 and f_2. Sum of all frequencies is 50. **CBSE2010-4M**

Class	0-20	20-40	40-60	60-80	80-100	100-120
Frequency	5	f_1	10	f_2	7	8

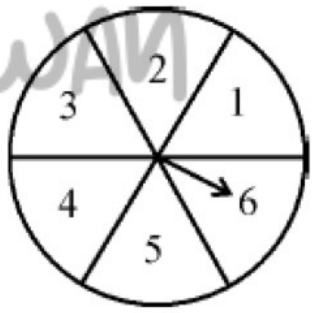
Probability

1. From a well shuffled pack of card a card is drawn at random. Find the probability of getting a black queen. **CBSE2008-1M**
2. Two coins are tossed simultaneously. Find the probability of getting exactly one head. **CBSE2009-1M**
3. From a well shuffled pack of card a card is drawn at random. Find the probability of getting a red face card. **CBSE2010-1M**
4. A die is thrown twice. What is the probability that the same number will come up either time? **CBSE2010-1M**
5. Which of the following can't be probability of an event? **CBSE2011-1M**
   (a) 1.5 (b) 3/5 (c) 25% (d) 0.3
6. Cards marked with numbers 2, 3, 4, 5, ..., 11 are placed in a box. One card is drawn at random from the box. Find the probability that number is a prime number. **CBSE2012-1M**
7. Two dice are thrown together. Find the probability of getting the same number on both the dice. **CBSE2012-1M**
8. Find the probability of getting an even number when a die is thrown once. **CBSE2013-1M**
9. A box contains 90 discs. A disc is drawn at random. Find the probability that it bears a prime number less than 23. **CBSE2013-1M**
10. If P(A) denotes the probability of an event A, then **CBSE2013-1M**
    (a) $P(A)<0$ (b) $P(A)>1$ (c) $0 \le P(A) \le 1$ (d) $-1 \le P(A) \le 1$
11. One ticket is selected at random from tickets numbered 1 to 40. Find the probability the selected ticket has a number which is a multiple of 7. **CBSE2013-1M**
12. If two dice are rolled together then find the probability of getting even number on both the dice. **CBSE2014-1M**
13. A number is selected at random from 1 to 30. Find the probability of getting a prime number. **CBSE2014-1M**
14. In a family of 3 children, find the probability of having at least one boy. **CBSE2014-1M**
15. A letter of English alphabet is chosen at random. Determine the probability that the chosen letter is consonant. **CBSE2015-1M**
16. Two different dice are tossed together. Find the probability that the product of the two numbers on the top of the dice is 6. **CBSE2015-1M**
17. A game of chance consists of spinning an arrow which comes to rest pointing at one of the numbers 1, 2, 3, 4, 5, 6, 7, 8 and these are equally likely outcomes. Find the probability that the arrow will point at any factor of 8. **CBSE2015-1M**
18. Cards marked with number 3, 4, 5, ..., 50 are placed in a box and mixed thoroughly. A card is drawn at random from the box. Find the probability that the selected card bears a perfect square number. **CBSE2016-1M**
19. A letter of English alphabet is chosen at random. Find the probability that the letter is from the word MATHEMATICS. **CBSE2016-1M**
20. 20 tickets, on which numbers 1 to 20 are written, are mixed thoroughly and then a ticket is drawn at random out of them. Find the probability that the number on the drawn ticket is a multiple of 3 or 7. **CBSE2016-1M**
21. A card is drawn at random from a well shuffled pack of 52 cards. Find the probability of getting neither a red card nor a queen. **CBSE2016-1M**
22. The probability of selecting a rotten apple randomly from a heap of 900 apples is 0·18. What is the number of rotten apples in the heap? **CBSE2017-1M**
23. A number is chosen at random from the numbers $-3,-2,-1,0,1,2,3$. What will be the probability that square of this number is less than or equal to 1? **CBSE2017-1M**
24. If three different coins are tossed together, then find the probability of getting two heads. **CBSE2017-1M**

25. Cards marked with numbers 3, 4, 5, ..., 50 are placed in a box and mixed thoroughly. One card is drawn at random from the box. Find the probability that number on the drawn card is (i) Divisible by 7. (ii) A number which is a perfect square. **CBSE2007-2M**
26. A die is thrown once. Find the probability of getting (i) An even prime number
(ii) A multiple of 3 **CBSE2008-2M**
27. A coin is tossed two times. Find the probability of getting at least one head.
CBSE2011-2M
28. A card is drawn from a well shuffled 52 cards. Find the probability that the card is (a) a red king card (b) a queen or a jack **CBSE2012-2M**
29. A number is selected at random from first 50 natural numbers. Find the probability that it is a multiple of 3 and 4. **CBSE2012-2M**
30. A card is drawn from well shuffled 52 cards. Find the probability that the card drawn is neither a king nor a queen. **CBSE2013-2M**
31. A card is drawn from a well shuffled 52 cards. Find the probability that the card is (a) a red face card (b) a black king **CBSE2013-2M**
32. Rahim tosses a coin two times. Find the probability of getting at least one tail.
CBSE2014-2M
33. Two different dice are tossed together. Find the probability **CBSE2014-2M**
(i) that the number on each die is even. (ii) that the sum of numbers appearing on the two dice is 5.
34. Two different dice are thrown together. Find the probability that the product of the numbers appeared is less than 18. **CBSE2017-2M**
35. Two different dice are tossed together. Find the probability : **CBSE2018-2M**
(i) of getting a doublet (ii) of getting a sum 10, of the numbers on the two dice.
36. A bag contains 5 red balls and some blue balls. If the probability of drawing a blue ball from the bag is three times that of a red ball, find the number of blue balls in the bag. **CBSE2018-2M**
37. A bag contains 5 white balls, 7 red balls, 4 black balls and 2 blue balls. A ball is drawn at random from the bag. Find the probability that the drawn ball is (i) white or blue, (ii) neither white nor black. **CBSE2018-2M**
38. A number is selected at random from the first 50 natural numbers. Find the probability that it is a multiple of 3 and 4. **CBSE2018-2M**
39. A card is drawn at random from a well shuffled pack of 52 playing cards. Find the probability of getting (i) a red king (ii) a queen or a jack. **CBSE2018-2M**
40. An integer is chosen at random between 1 and 100. Find the probability that it is :
(i) divisible by 8. (ii) not divisible by 8. **CBSE2018-2M**
41. A bag contains 5 red balls and some blue balls. If the probability of drawing a blue ball from the bag is thrice that of a red ball, find the number of blue balls in the bag. **CBSE2007-3M**
42. The king, queen and jack of clubs are removed from a deck of 52 playing cards and the remaining cards are shuffled. A card is drawn from the remaining cards. Find the probability of getting a card of (i) heart (ii) queen (iii) clubs. **CBSE2009-3M**
43. Two dice are thrown simultaneously. What is the probability that **CBSE2009-3M**
(i) 5 will not come up on either of them? (ii) 5 will come up on at least one?
(iii) 5 will come up at both dice?
44. Card numbered 1, 2, ...35 are kept in a bag. A card is drawn at random from the bag. Find the probability that the card being picked is **CBSE2010-3M**
(i) Prime number less than 15 (ii) A number divisible by 3 and 5.
45. From a well-shuffled pack of playing cards, black jacks, black kings and black aces are removed. A card is drawn at random from the pack. Find the probability of getting
(i) a red card, (ii) not a diamond card. **CBSE2010-3M**
46. Two dice are rolled once. Find the probability of getting such numbers on two dice, whose product is a perfect square. **CBSE2011-3M**

perfect square (d) an even prime number **CBSE2014-4M**

63. All the red face cards are removed from a pack of 52 playing cards. A card is drawn at random from the remaining cards, after reshuffling them. Find the probability that the drawn card is (i) of red colour (ii) a queen (iii) an ace (iv) a face card **CBSE2014-4M**
64. A bag contains 20 cards numbered from 1 to 20. A card is drawn at random from the bag. Find the probability that the drawn card is (a) divisible by 2 or 3 (b) a prime number **CBSE2015-4M**
65. A box contains cards bearing numbers from 6 to 70. If one card is drawn at random from the box , find the probability that it bears **CBSE2015-4M**
(i) a one digit number. (ii) a number divisible by 5.
(iii) an odd number less than 30. (iv) a composite number between 50 and 70.
66. A card is drawn at random from a well-shuffled deck of playing cards. Find the probability that the card drawn is **CBSE2015-4M**
(i) a card of spade or an ace. (ii) a black king.
(iii) neither a jack nor a king. (iv) either a king or a queen.
67. A game of chance consists of spinning an arrow on a circular board, divided into 8 equal parts, which comes to rest pointing at one of the numbers 1, 2, 3, ..., 8, which are equally likely outcomes. What is the probability that the arrow will point at (i) an odd number (ii) a number greater than 3 (iii) a number less than 9. **CBSE2016-4M**
68. The king, Queen and Jack of clubs are removed from a deck of 52 playing cards and remaining cards then well shuffled. Now a card is drawn at random from the remaning cards. Find the probability that the drawn card is : (i) a card of hearts (ii) a red jack (iii) a black card. **CBSE2016-4M**
69. In fig. is shown a disc on which a player spins an arrow twice. The fraction $\frac{a}{b}$ is formed, where 'a' is the number of sector on which arrow stops on the first spin and 'b' is the number of the sector in which the arrow stops on second spin. On each spin, each sector has equal chance of selection by the arrow. Find the probability that the fraction $\frac{a}{b} > 1$. **CBSE2016-4M**



70. A number x is selected at random from the numbers 1, 2, 3 and 4. Another number is selected at random from the numbers 1, 4, 9 and 16. Find the probability that the product of x and y is less than 16. **CBSE2016-4M**
71. Two different dice are thrown together. Find the probability that the numbers obtained have (i) even sum, and (ii) even product. **CBSE2017-4M**
72. Peter throws two different dice together and finds the product of the two numbers obtained. Rina throws a die and squares the number obtained. Who has the better chance to get the number 25. **CBSE2017-4M**
73. A box contains 90 discs which are numbered from 1 to 90. If one disc is drawn at random from the box, find the probability that it bears (i) a two-digit number, (ii) a number divisible by 5. **CBSE2017-4M**
74. From a pack of 52 playing cards, Jacks and Kings of red colour and Queens and Aces of black colour are removed. The remaining cards are mixed and a card is drawn at random. Find the probability that the drawn card is **CBSE2017-4M**
(i) a black Queen (ii) a card of red colour (iii) a Jack of black colour (iv) a face card

75. A box contains cards numbered from 1 to 20. A card is drawn at random from the box. Find the probability that number on the drawn card is **CBSE2018-4M**
(i) a prime number (ii) a composite number (iii) a number divisible by 3

76. The King, Queen and Jack of clubs are removed from a pack of 52 cards and then the remaining cards are well shuffled. A card is selected from the remaining cards. Find the probability of getting a card **CBSE2018-4M**

(i) of spade (ii) of black king

(iii) of club (iv) of jacks

KHATAM