STANDARD X QEPR

Quality Education Pupil's Right

Orukkam 2017

An Intensive Learning Material

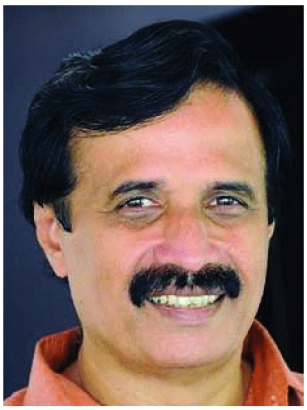
Mathematics

Department of General Education , Kerala

Orukkam Activities - Guidelines

Orukkam 2017, which is an intensive learning material, is an examination aid for Standard X students. It aims at achieving best results to all students in the SSLC Examination through a systematic process. Each unit is analysed, answers explained and on the basis of these the students may undergo a process on the discourses. During the process of the activities, students may self-assess their answers and analyse them based on the process mentioned in this book. Teachers may share the problems that arise during the process and help the students to overcome such problems. The activities in this book is to be completed time bound and should help the students to inculcate the process. Heads, teachers, students and parents should come cooperate and associate on the implementation of this process and assure the best result in their schools. Hope all of you will do the best.

All heads of institutions should ensure that the programme of this learning material has started in the school from January 11, 2017.
Convene a meeting of SRG in the first week of January and plan the activities.
PTA, MPTA, SMC, meetings should be held in the school to ensure their support.
Provide food for students.
Each teacher should explain how the material can be effectively imparted in the classroom.
Programmes similar to this can be held in class 8 and 9.
Let's work together to achieve the goal of Excellence.



PROF. C. RAVEENDRANATH
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സന്ദേശം

കേരളത്തിലെ സ്കൂൾ വിദ്യാഭ്യാസം നേരിടുന്ന പ്രശ്നങ്ങൾ പഠിച്ച് അവ പരിഹരിക്കുന്നതിനുള്ള ക്രിയാത്മക പ്രവർത്തനങ്ങൾ നടപ്പിലാക്കുക എന്ന ലക്ഷ്യത്തോടെ 2006ൽ ആരംഭിച്ച **ഗുണമേന്മയുള്ള വിദ്യാഭ്യാസം കുട്ടികളുടെ അവകാശം** (Quality Education Pupil's Right - QEPR) എന്ന പദ്ധതി പത്തുവർഷം പൂർത്തിയാക്കുകയാണ്. സ്കൂളുകളിലെ ലാബ്, ലൈബ്രറി സൗകര്യങ്ങളുടെ മെച്ചപ്പെടുത്തൽ, പോഷകസമൃദ്ധമായ ഉച്ചഭക്ഷണം, കൃത്യമായി ആസൂത്രണം ചെയ്ത് നടപ്പിലാക്കുന്ന പഠനപ്രവർത്തനങ്ങൾ, ഫലപ്രദമായ മോണിറ്ററിംഗ് എന്നിവയിലൂടെ പിന്നോക്കം നിന്നിരുന്ന വിദ്യാലയങ്ങൾ ശ്രദ്ധേയമായ പുരോഗതി കൈവരിച്ചു കഴിഞ്ഞു. കൂട്ടായ പരിശ്രമങ്ങളിലൂടെ ലഭിച്ച നേട്ടങ്ങളെ സ്ഥായിയായി നിലനിർത്തുകയും ആധുനിക സാങ്കേതികവിദ്യയുടെ സാധ്യതകൾ കൂടി ഉപയോഗിച്ചു സ്കൂളുകളുടെ നിലവാരം കൂടുതൽ മികവുറ്റതാക്കി അന്താരാഷ്ട്ര നിലവാരത്തിലേക്ക് ഈ പൊതു വിദ്യാലയങ്ങളെ എത്തിക്കുകയും ചെയ്യേണ്ടിയിരിക്കുന്നു. ഈ ഉദ്ദേശ്യത്തോടെ ഒട്ടേറെ പ്രവർത്തനങ്ങൾ ഇപ്പോൾ ആരംഭിച്ചുകഴിഞ്ഞിട്ടുണ്ട്. സ്കൂളുകളുടെ ഭൗതീകസൗകര്യങ്ങളോടൊപ്പം അക്കാദമിക നിലവാരവും ഉയർത്തുന്നതിനുള്ള ശ്രമത്തിന്റെ ഭാഗമാണ് **ഒരുക്കം** എന്ന ഈ കൈപുസ്തകം. കുട്ടികൾക്ക് ഈ പഠനസഹായി ഏറെ സഹായകരമാകുമെന്ന് പ്രതീക്ഷിക്കുന്നു. ഈ ഉദ്യമത്തിന് എല്ലാ ഭാവുകങ്ങളും നേരുന്നു.

സി.രവീന്ദ്രനാഥ്

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ആമുഖം

കേരളത്തിലെ സ്കൂളുകൾ മികച്ച വിജയത്തിലേക്ക്

തെരഞ്ഞെടുക്കപ്പെട്ട വിദ്യാലയങ്ങളിൽ 2006ൽ ആരംഭിച്ച **ഗുണമേന്മയുള്ള വിദ്യാഭ്യാസം കുട്ടികളുടെ അവകാശം (QEPR)** പദ്ധതി അതിന്റെ ലക്ഷ്യം നേടി മുന്നേറുകയാണ്. അക്കാദമികവും ഭൗതികവുമായ തലങ്ങളിൽ നിരവധി മുന്നേറ്റങ്ങൾ കൈവരിക്കുവാൻ ഈ പദ്ധതിയിലുൾപ്പെട്ട വിദ്യാലയങ്ങൾക്ക് കഴിഞ്ഞിട്ടുണ്ട്. കേവല വിജയമല്ല മറിച്ച് മുഴുവൻ വിദ്യാർത്ഥികളെയും മികച്ച ഗ്രേഡിന് ഉടമകളാക്കുക എന്ന ലക്ഷ്യമാണ് നമ്മൾ ആഗ്രഹിക്കുന്നത്. ഈ ലക്ഷ്യം മുന്നിൽ കണ്ടുകൊണ്ട് ഒട്ടേറെ പ്രവർത്തനങ്ങൾ ആവിഷ്കരിച്ചു നടപ്പാക്കി വരുകയാണ്.

മികച്ച വിജയം ലക്ഷ്യമാക്കി 2017 ജനുവരി 11 മുതൽ എല്ലാ ക്യൂ.ഇ.പി.ആർ വിദ്യാലയങ്ങളിലും പ്രത്യേക പഠനപാക്കേജുകൾ നടത്തുവാൻ തീരുമാനിച്ചിട്ടുണ്ട്. ഈ പരിപാടിയുടെ കാര്യക്ഷമമായ നടത്തിപ്പിന് വേണ്ടിയാണ് **ഒരുക്കം** എന്ന പഠനസഹായി തയ്യാറാക്കിയിട്ടുള്ളത്. മാറിയ പാഠപുസ്തകം കുട്ടികളിലുണ്ടാകാവുന്ന മാനസിക പിരിമുറുക്കങ്ങളിൽ നിന്ന് കുട്ടികളെ മോചിപ്പിക്കുന്നതിനും അവരിൽ ആത്മവിശ്വാസം ഉണ്ടാക്കുന്നതിനും സർഗ്ഗാത്മകമായ പുനരനുഭവപ്രവർത്തനങ്ങൾ, മൂല്യനിർണയ പ്രവർത്തനങ്ങൾ, അവയുടെ വിശകലനങ്ങൾ എന്നിവ ഉൾക്കൊള്ളുന്ന **ഒരുക്കം** പ്രയോജനപ്പെടും എന്നതിൽ സംശയമില്ല.

വിദ്യാർത്ഥികൾ, രക്ഷിതാക്കൾ, പ്രാദേശിക ഭരണകൂടങ്ങൾ, വിദ്യാഭ്യാസ പ്രവർത്തകർ തുടങ്ങിയവരുടെ കൂട്ടായ പരിശ്രമത്തിലൂടെ ഗുണനിലവാരത്തോടെ മികച്ച വിജയം നേടിയെടുക്കാനുള്ള വർഷമായി 2017 മാറട്ടെ എന്നും ഈ ലക്ഷ്യം നേടാൻ എല്ലാ വിദ്യാലയങ്ങൾക്കും കഴിയട്ടെ എന്നും ആശംസിച്ചുകൊണ്ട്

വിജയാശംസകളോടെ

കെ. വി. മോഹൻ കുമാർ ഐ.എ.എസ്
പൊതു വിദ്യാഭ്യാസ ഡയറക്ടർ

About the content of the book

The study of mathematics and giving examination are complimentary to each other.The confidence that we acquire from systamatic learning and practice work wonders as it enhances our performance and strengthens us during examinations. Hence mathematics can truly be called 'mathemagic' . Revision is an inevitable aspect of mathematics . Revising the learned portions will help in answering or attempting the questions without any apprehensions and hesitations . Drawing inspiration from the elaborated ideas provided by the text books , a revision package is being prepared.

Prepared by:

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1.Arithmetic Sequences

Important Concepts

1. Sequences and its algebra
2. The relation between common difference, terms and position of terms
   ⋆ The difference between two terms of an arithematic sequence will be the product of the difference between their positions and its common difference
   ⋆ $x_m - x_n = (m-n)d$
3. The algebra of an arithmetic sequence is always in the form $an + b$.Here $a$is the common difference and $a + b$is the first term.
4. The terms of an arithmetic sequence leaves the same remainder on dividing by the common difference
5. When p times common difference is added to nth term of an arithmetic sequence we get $(n + p)$th term
   $$x_n + pd = x_{(n+p)}$$
   For example, $x_5 + 6d = x_{11}, x_{20} + 10d = x_{30}$
6. The sum of some natural numbers from 1 is half the product of natural number at the end and its successor
   $$\frac{n(n+1)}{2}$$
7. The sum of first n terms of an arithmetic sequence having algebraic form is
   $$s_n = a \times \frac{n(n+1)}{2} + bn$$
8. If an arithmetic sequence has odd number of terms the middle term will be half of the sum of the terms
9. The sum of some numbers forming an arithmetic sequence will be half the sum of first and last number in the sequence

Worksheet 1

Answer the following questions

1. Write the sequence of natural numbers
   –

[1]ORUKKAM 2017—Mathematics—Department of General education, Kerala

2. Write the sequence of odd numbers
   –

3. Write the sequence of even numbers
   –

4. Write the sequence of multiples of 3
   –

5. Write the sequence of numbers which leaves the remainder 1 on dividing by 4
   –

6. Write the sequence of prime numbers

   –

7. Write the sequence of perfect squares
   –

8. Write the sequence of numbers which leaves the remainder 0 on dividing by 6
   –

9. Write the sequence starting from 1 and$\frac{1}{2}$is added subsequently
   –

10. Write the sequence starting from $\frac{1}{2}$and $\frac{3}{4}$is added subsequently
    –

11. Write the sequence starting from 60and0is added subequently
    –

Worksheet 2

1. Write the sequence of the perimeters of the equilateral triangles having sides 1cm , 2cm, 3cm$\cdots$.
   Write the sequence of area
   Write the sequence of angle sums
   –

   2

2. Write the sequence of numbers which leaves the remainder 3 on dividing by 5 and10
   –

[2]ORUKKAM 2017—Mathematics—Department of General education, Kerala

3. Look at the sequence $1+(1+5), 2+(2+5), 3+(3+5)\cdots$
   a)Write next two terms
   b) Write its algebra
   $- -$

4. Write the terms of the sequence $5\times(1+6), 10\times(2+6), 15\times(3+6), 20\times(4+6)\cdots$ in the form : first term $5\times 1(1+6)$, second term $5\times 2(2+6)$.Write its algebra
   $- -$

Worksheet3

1. Write eigtht terms of an arithmetic sequence using the numbers given below $(22, 15, 18, 4, 10, 14, 6, 12)$
   $- -$

2. Write the missing terms in the arithmetic sequence given below .
   a)$5, -, -, 14, -, 20, -, 27$
   b)$2, 6, 10, 14, -, -, -, 28$
   c)$-, -, 5, 8, 11, -, -, 19$
   d)$-, 40, -, 20, -, -, -10, -20$

3. The difference between 12th and 8 th term of an arithmetic sequence is 20. Find the common difference . [3]

4. The tenth term of an arithmetic sequence is 65 and its 15 th term is 80. Is 200 a term of this sequence ?

5. The 20th teerm of an arithmetic sequence is 64 and its 21th term is 70. . Can the difference between two terms 46? why?

6. The angles of a quadrilateral are in an arithmetic sequence. The largest angle is 150°. Find other angles ?

7. What will be the remainder on dividing a term of the sequence $3n+7$ by its common difference ?

Worksheet4

Write the algebra of the following sequences and its sum of n terms

1. $5, 10, 15, 20\cdots$

[3] ORUKKAM 2017—Mathematics—Department of General education, Kerala

2. $6, 11, 16, 21 \cdots$

3. $4, 9, 14, 19 \cdots$

4. $3, 8, 13, 18 \cdots$

Worksheet5

1. The algebra of an arithmetic sequence is $3n - 2$. Write the sequence. Is 99 a term of this sequence
2. Find the sum of first 20 natural numbers. How much more the sum of first 40 natural numbers that this ?
3. Write the algebra of $10.18, 26 \cdots$. Calculate the sum first 30 terms
4. An aruithmetic sequence has 15 terms.What is the position of middle term in the order line of terms ?
5. 21 is the middle term of an arithmetic sequence.How many terms are there in this sequence?
6. The eighth term of an arithmetic sequence is 40. Calculate the sum of first 15 terms
7. The sum of first 21 terms of this sequence is 630. Find its eleventh term
8. The angles of a nine sided polygon are in an arithmetic sequence. Which degree measure is always a term of this sequence ?
9. The angles of a 36 sided polygon form an arithmetic sequence with common difference 1. What is the smallest angle ?
10. The fisrt term of an arithmetic sequencs is 10 ,twenteth term 60. Calculate the sum of first 20 terms

Worksheet 6

1. Write the sequence of the squares of all odd numbers. What is its algebra?
2. Write the sequence formed by the number of diagonals from a vertex of a triangle , a quadrilateral, a pentagon etc.What is its algebra?

3. Write the sequence of the number of diagonals in a quadrilateral , pentagon, hexagon etc –. What is its algebra?

4. Can the difference between any two terms of an arithemetic sequence having common difference 6 be 2016? Justify your answer

5. The common difference of an arithmetic sequence is a prime above 2. The difference between two terms is 224. Can 2017 be the difference between any two terms of this sequence

6. The first term of an arithmetic sequence is $\frac{5}{4}$and common difference $\frac{2}{3}$. Can a counting number belongs to this sequence ?

7. Two terms of an arithmetic sequence having natural number terms are 50and 85. Also, 60 is not a term of this sequence. Is 134 a term of this sequence? Justify your opinion [5]

8. Write the algebra of $17, 20, 23, 26 \cdots$. Is 400 a term of this sequence?Can the square of a term belongs to this sequence

9. Prove that sum of some terms from the beginning of the sequence in the order $56, 88, 120 \cdots$can never be a perfect square. What should be added to the sum makes it a perfect square

10. Write algebra of the sum of the sequence $6n + 5$. Can the sum 2000?Why?

Worksheet7

1. Prove that the squares of the terms of this sequence belongs to that sequence itself

2. In an arithmetic sequence having terms natural numbers , prove that if one of the terms is a perfect square , it will have more that this as the perfect square term
   Hint: As we know a definite number of common difference of an arithmetic is added to a term we get another term of the same sequence . If n^2 is a perfect square term , add $(2n + d)$times d to n^2 . $n^2 + (2n + d) \times d = (n + d)^2$. This is nothing but a perfect square term

3. If the angles of a right triangle are in an arithmetic sequence , find them by making suitable equations

4. If ten times tenth term of an arithmetic sequence is equal to fifteen times fifteenth term ,find 25th term. Calculate the product of first 25 terms

[5] ORUKKAM 2017—Mathematics—Department of General education, Kerala

5. Write the algebraic form of $1, 4, 7, 10 \cdots$ .Is 100 a term of this sequence . Why?. Prove that the square of any term of this sequence belongs to that sequence

6. Two arithmetic have same common difference. If their first terms are $5, 8$ respectively, what is the difference between their eleventh terms

Worksheet 8

1. Find the sum of n terms of the sequence $6, 10, 14 \cdots$? How many terms of this sequence from the beginning in an order makes the sum 240. Can the sum of first few terms in an order makes the sum 250? Why?

2. The 5 th term of an arithmetic sequence is 40 and 10th term 20. Find 15th term. How many terms of this sequence makes the sum 0

3. Prove that the sequence $5, 8, 11 \cdots$ contains no perfect squares

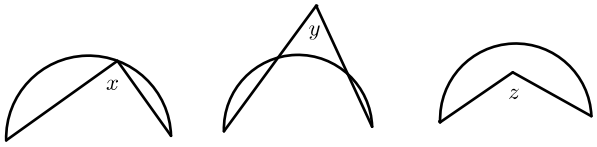
4. The angles of a polygon are in an arithmetic sequence. The smallest angle is $120°$, common difference $5°$Find the number of sides
   sum $= 5(1 + 2 + 3 \cdots + n) + 115n = (n - 2) \times 180$
   $5 \times \frac{n}{2}(n + 1) + 115n = (n - 2) \times 180$, $n^2 - 25n + 144 = 0$,$n = 9$

2. Circles and Tangents

Important Points

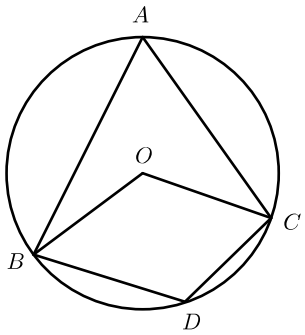
[1]

1. The angles on the semicircle, outside the semicircle and inside the semicircle are given below



In the figure $x$is the angle on the semicircle , y is the angle outside the semicircle and z is the angle inside the semicircle

2. An arc can make three angles
   ⋆ Angle on the arc
   ⋆ Angle at the center
   ⋆ Angle in the complement.



In the figure$\angle BDC$is the angle made by the arc BDCon the arc. $\angle BOC$is the angle made at the center. $\angle BAC$ is the angle made by the arc in the complement.

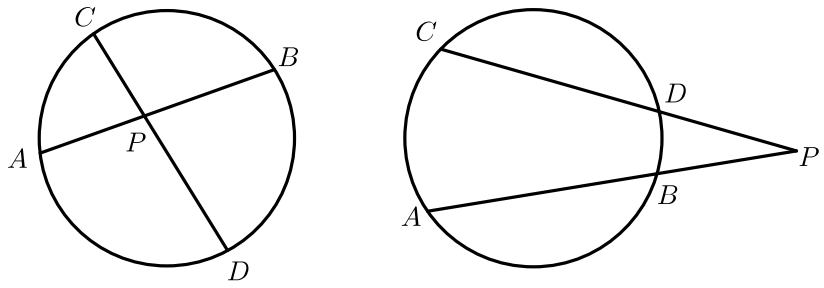
3. Remember the following relations
   ⋆ The angle formed by the arc in the complement is half of the angle in formed by the arc at the center
   ⋆The sum of the angles on the arc and in the complement is 180°.

4. Infinite number of angles can be drawn on an arc. All these angles are equal

5. If the vertices of a quadrilteral lie on a circle it is called cyclic quadrilateral.
   ⋆ The sum of the opposite angles of a cyclic quadrilaeral is 180°.
   ⋆If the opposite angle sum is 180°it will be a cyclic quadrilateral.
   ⋆ Among the quadrilaterals having a specific name ,square,rectangle and isoscles trapezium are cyclic

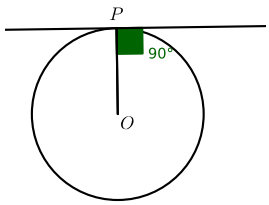
[1]Orukkam 2017—mathematics —Department of General Education, Kerala

6. Look at the figure given below

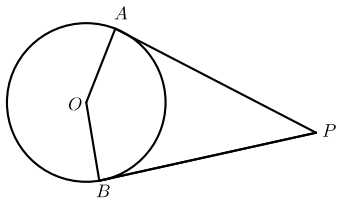


In the first figure $AB, CD$are the chords . The chords meet at P inside the circle. We can establish the relation $PA \times PB = PC \times PD$. This can be viewed as the areas of two rectangles having sides PA, PB and PC, PD.
⋆ This relation holds if the chords meet outside the circle
⋆ If one chord is a diameter and other chord is perpendicular to the diameter then $PA \times PB = PC^2$.

7. Tangents to the circle is perpendicular to the radius through the point of tangency .



8. The tangents from an exterior point to a circle and radii to the points of tangency form a cyclic quadrilateral



9. The angle between a chord of a circle and the tangent at one end of the chord is equal to angle formed by the chord in the other side of the circle

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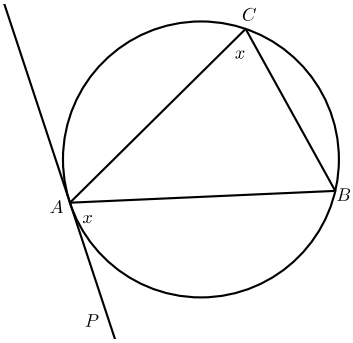
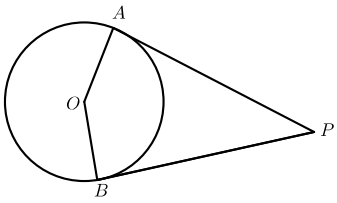


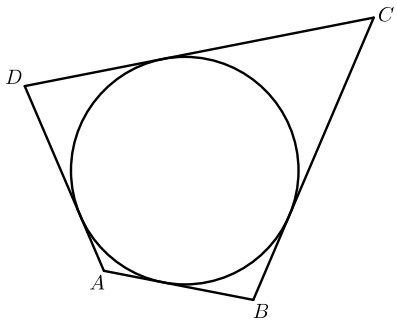
3

10. Tangents from an exterior point to a circle are equal



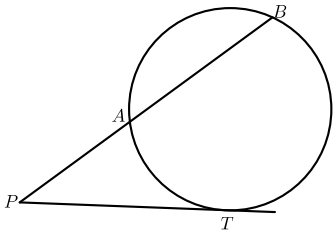
If $PA, PB$are the tangents then $PA = PB$

11. If a circle touches the sides of a quadrilateral ,that circle will be the incircle of the quadrilateral. Sum of the opposite sides of such quadrilateral are equal



In the figure ,$ABCD$is a quadrilateral having incircle $AB + CD = AD + BD$.

12. If P is an exterior point to a circle , a line from P touches the circle at T on the circle and a line intersect the circle at A and$B$ then $PA \times PB = PT^2$



13. The center of the circle which touches two lines will be a point on the bisector of the angle between the lines . The bisectors of the angles of a triangle passes through a point. That point will be the incenter of the triangle

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14. The circle drawn inside a triangle which touches the sides of the triangle is called incircle. The circles drawn outside the triangle which touches the sides of the triangle are excircles

15. The radius of the incircle of a triangle is obtained by dividing area of the circle by its semi perimeter

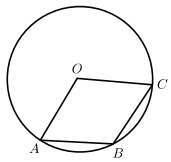
16. If$a, b, c$are the sides of a triangle then the area of the triangle $A = \sqrt{s(s-a)(s-b)(s-c)}$, $s = \frac{a+b+c}{2}$. This is popularly known as Hero's formula.

4

Worksheet 1

1. In triangle $ABC AB = 8$cm, $BC = 6$cm , $AC = 10$cm.
   ⋆What kind of triangle is this?
   ⋆ What is the position of B based on the circle with ACas the diameter?Why?
   ⋆ What is the position of A based on the circle with BC as the diameter? Why?
   ⋆ What is the position of the point C based on the circle with diameter AB ?

2. Three vertices of a parallelogram are on a circle and the fourth vertex is at the center. Find the angles of the parallelogram



   ⋆ Mark a point P on the top of the figure on the circle, join AP and CP.
   ⋆If angle $APC = x$then write $\angle AOC$
   ⋆ Write$\angle ABC$
   ⋆Write $\angle ABC + \angle APC$
   ⋆ What is $\angle APC$
   ⋆ Find the angles

3. In triangle ABC, $AB = AC$.angle $BAC = 30°, BC = 5$cm Find the radius of ABC
   ⋆Draw the figure
   ⋆ Mark the center, BO and CO
   ⋆ Find the measure of angleBOC
   ⋆ Write the angles of triangle OBC

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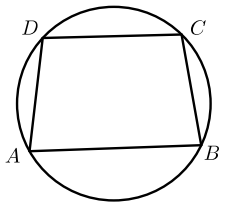
⋆ What kind of angle is triangle OBC
⋆ Write the radius of the circumcircle

4. $PQRS$is cyclic. $\angle P = 3x, \angle Q = y, \angle R = x, \angle = 5y$. Find the angles
   ⋆Draw circle ,mark P, Q, R, Son it , complete $PQRS$
   ⋆ Enter the given angles
   ⋆What is $3x + x$? .Find x
   ⋆ what is $y + 5y$?. Find y
   ⋆Find the angles

5. in the figure $ABCD$is a trapezium. If the vertices are on a circle ,prove that it is an isoceles trapezium



   ⋆ Draw figure
   ⋆What is $\angle A + \angle C$?
   ⋆What is $\angle B + \angle C$?
   ⋆ Write the relation between $\angle A, \angle B$
   ⋆Write the conclusion

6. In $\triangle ABC AB = AC$. P is the mid point of $AB$and Q is the midpoint of AC . prove that $BPQC$is cyclic
   ⋆ Draw figure.Mark $PQ$and complete$BPQC$.
   ⋆ Is PQ parallel to BC
   ⋆ Note that$\angle B = \angle C$
   ⋆ What is $\angle C + \angle Q$
   ⋆ What is $\angle B + \angle Q$
   ⋆ Write conclusion

Worksheet 2

5

1. Prove that $ABCD$ given in the figure is cyclic

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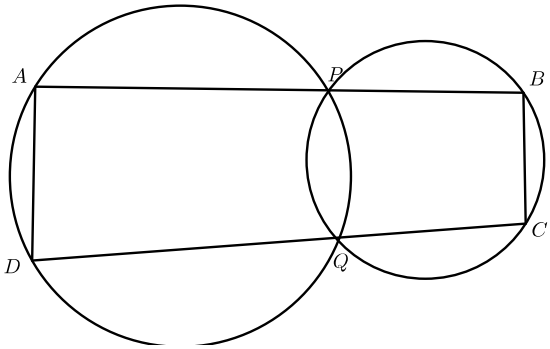
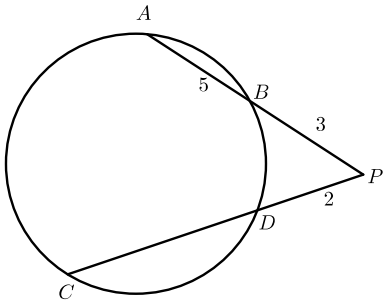


⋆ Draw figure and mark PQ
⋆ If $\angle BAP = x$then what is $\angle BQP$?
⋆ Find$\angle PQD$ ⋆ Find $\angle PCD$? Why ? ⋆ What is $\angle A + \angle C$? ⋆ Is ABparallel to CD? why? ⋆ Explain how $\angle B + \angle C = 180°$ ⋆ Write conclusion

6

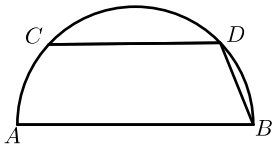
Worksheet3

1. in the figure $AB, CD$are extented and intersect at P. If $AB = 5, BP = 3, PD = 2$ then find CD ?



⋆Draw the figure
⋆Write the relation betweenPA, PB, PC, PD
⋆ Find CD

2. In the figure $AB$is the diameter and $CD$is parallel to the diameter. $AB = 8$cm, $BD = 2$cm ,findCD



Draw DP perpendicular to AB, $PA \times PB = PD^2$. If$PB = x$then $PA = 8 - x$.

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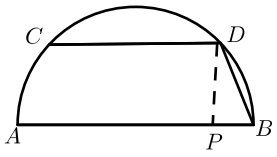


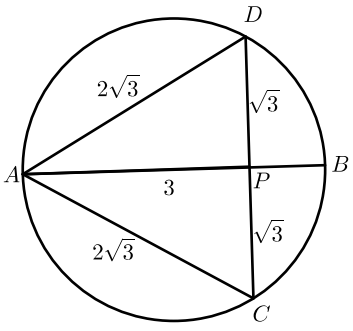
$x(8-x) = PD^2, 2^2 = x^2 + PD^2$
$x(8-x) = 4 - x^2, 8x - x^2 = 4 - x^2,$
$8x = 4, x = \frac{1}{2}$
Similarly draw CQ perpendicular to AB
$AQ = \frac{1}{2}$. $PQ = 8 - (\frac{1}{2} + \frac{1}{2}) = 7$
$CD = 7$cm

3. Draw a rectangle of length 6cm and width 4cm. Draw another rectangle whose area equal to area of the first rectangle and one of the sides 8cm.
⋆Draw $ABCD$ as in the given measurement.
⋆ Mark E by extending AB to 2cm more . $AE = 8$will be 8cm.
⋆ With$A$as center and AEradius draw an arc .This arc cut DA produced at F
⋆ Extend BAsuch that $AD = AG$ and mark G
⋆ Draw triangle $GFB$and construct circumcircle. The circle meet AD at H.
⋆ Complete the rectangle $AHIE$

[7]

Worksheet 4

1. Draw an equilateral triangle of height 3cm. What is the length of a side? Write the principle of construction
Students are advised to construct as in the steps given below .



⋆Draw a circle of radius 2cm and mark a diameter AB which is 4cm . Mark a point P from one end A 3 cm apart on the diameter
⋆ Draw a chordCD perpendicular toAB. Complete triangle CAD
⋆ Using $PA \times PB = PD^2$, $PD = \sqrt{3}$. Now we get $AD = AC = CD = 2\sqrt{3}$.
Height $AP = 3$cm .

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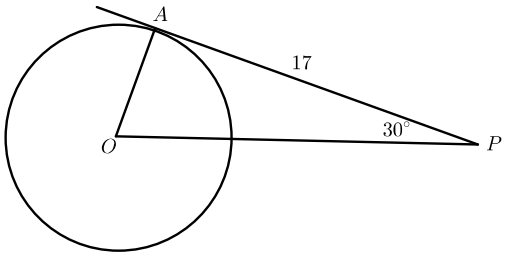
2. Calculate the radius of the circle in which a tangent of length 12 cm is drawn from a point at the distance 13cm from the center
   ⋆Draw rough figure
   ⋆ Use Pythagoros theorem

Worksheet 5

[8]

1. In the figur PA is a tangent and$O$ is the center of the circle. $PA = 17, \angle OPA = 30°$then calculate the radius of the circle and distance from center to the point P



   ⋆ Triangle OAP is a $30°, 60°, 90°$right triangle. .
   ⋆Using the property of this special right triangle find the radius and the distance OP

2. $\triangle ABC$is an equilateral triangle. A circumcircle is drawn to it. Prove that the triangle formed by the tangents tothe circle at the vertics of ABC is another equilateral triangle.
   If the perimeter of $\triangle ABC$is 10cm ,calculate the perimeter of triangle PQR.
   What is the relation between the perimeters of triangle ABC and triangle PQR
   ⋆ Draw figure . mark the circumcenter of triangle ABC
   ⋆Join OA, OB, OC.Note the cyclic quadrilaterals in it.
   ⋆Since $\angle B = 60°$angle $\angle AOC$ will be $120°$ What is $\angle AQC$?
   ⋆ Find $\angle P, \angle R$. Write conclusions
   ⋆See three parallelograms like $ABCQ$. Find the perimeter of the outer triangle by the equality of opposite sides
   ⋆ AC is the diagonal whic divides the parallogram by two equal triangles .

3. Draw a circle and mark a point on it. Construct tangent to the circle at this point without using center.
   ⋆ Draw the circle and mark the point(P)
   ⋆ Draw a chordAB and join AP and BP.

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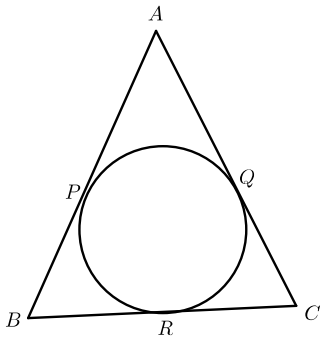
⋆See the chord in the figure that you have drawn. This chord made the angle $\angle PAB$ on one side. An equal angle will be formed on the other side of the chord at P with PB as one arm .(Use compass and scale method)

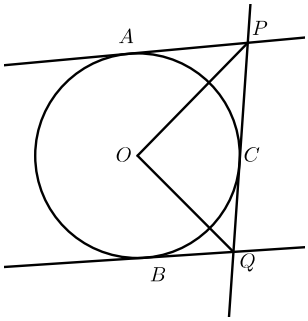
Worksheet 6

1. In the figure a circle touches the sides of $\triangle ABC$at P, Q, R. If $AB = AC$ then prove that $BR = CR$



   ⋆ Why$AP = AQ$?
   ⋆ Establish $BP = CQ$?
   ⋆ Establish $BR = CR$?

2. In the figure $AP, BQ, PQ$are tangents to the circle. The line $AP$is parallel to BQ.Find $\angle POQ$



   ⋆ Draw figure , mark OA, OB, OC.
   ⋆Establish angle OAP, angle OCP equal
   ⋆ Take $\angle AOP, \angle COP$ as x
   ⋆ Triangles BOQ, and $COQ$are equal. $\angle BOQ = \angle COQ = y$
   ⋆ $2x + 2y = 180$. Write $x + y$and $\angle POQ$

3. If a circle can be drawn by touching the sides of a parallogram inside it will be a rhombus . Prove!

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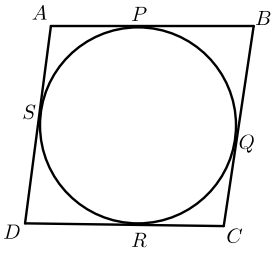
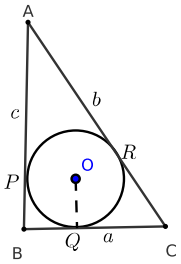


⋆ Draw figure . $AP = AS, BP = BQ, DR = DS, CR = CQ$
⋆ using these equations prove the statementgiven as the 11 th point in the basic concepts .
⋆ $2 \times AB = 2 \times AD$.

4. If r is the radius of the incircle of a right triangle prove that $r = \frac{a+c-b}{2}$



⋆ $BP = BR = r$
⋆ $AP = AQ = c - r$
⋆ $CR = CQ = b - r$
⋆$b = c - r + a - r$

5. Find the inradius of an equilateral triangle of side 10cm.
⋆ User $= \frac{A}{s}$.
⋆For this draw $30°, 60°, 90°$in it with an altitude and use its property

Worksheet 7

1. Draw a circle and construct $30°, 150°$angles on it
2. Draw a circle and construct $22\frac{1}{2}^\circ$ on it
3. Construct a rectangle with diagonal 8 cm, one of the sides 6 cm such that the vertices lie on the circle.
4. Draw a line of length $\sqrt{12}$. Construct a square with this line as a side. Can you construct a line of length $\sqrt{48}$in the same figure

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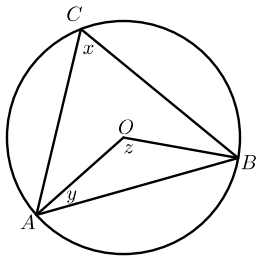
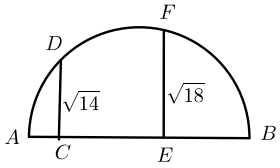
5. Draw a rectangle of length 7cm, and width 5cm and construct a square whose area is same as the area of this rectangle
6. In triangle ABC the radius of the circumcircle is 6 cm , $\angle A = 70°, \angle B = 80°$.Construct the triangle
7. Draw a rectangleof one side 5cm , width 7cm .Construct another rectangle whose one side is 8cm and area equal to the area of the first rectangle
8. Draw a circle of radius 3cm. Construct two tangents from a point at a distance 7cm from the center of this circle.
9. Draw a rhombus having one angle 40° and the radius of the incircle 4cm
10. Draw a square of side 5cm and construct a rectangle having one side 7cm and area equal to area of the square
11. In triangle ABC, $AB = 6$cm $AC = 8$cm , $\angle A = 120°$. Draw triangle and construct its incircle

Worksheet 8

1. What is the position of the vertex of an equilateral triangle with opposite side as the diameter ?
2. Prove that $x + y = 90°$ in the figure given below



3. Prove that trapezums having equal digonals are isoscles trapeziums
4. In the figure given below AB is the diameter ,$CD, EF$are perpendicular to the diameter. Find the length of AB as an integer



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5. Can a triangular sheet of sides 120cm, 100cm,and80cm be used to make a top cover of a well of radius 30cm
   $r = \frac{A}{s}$, $10\sqrt{7} < 10\sqrt{9}$

6. In triangle ABC, $AB = AC$.The circle through B touches the side AC at the mid point D of AC, passes throuch a point P on AB. Prove that $4 \times AP = AB$

7. The radius of a cone is 5cm, height 12cm. A sphere is placed inside the cone . The sphere touches its base . Calculate the radius of the cone

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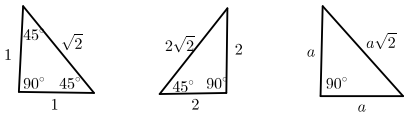
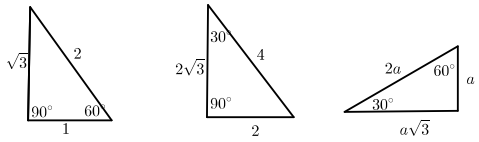
3.Trigonometry

ImportantConcepts

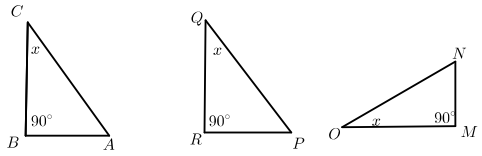
1. The ratio of the sides of the triangle having angles $45°, 45°, 90°$are in the ratio $1 : 1 : \sqrt{2}$



2. The ratio of the sides of the triangle having angles $30°, 60°, 90°$are in the ratio$1 : \sqrt{3} : 2$

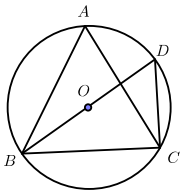


3. Look at the figure



⋆ If$\angle C = \angle Q = \angle O = x$then$\frac{AB}{AC} = \frac{PR}{PQ} = \frac{MN}{ON}$. This number is known as $\sin x$.
⋆ To get $\sin x$ divide the side opposite to x by the hypotenuse of the triangle
⋆ $\frac{BC}{AC} = \frac{QR}{PQ} = \frac{OM}{ON}$. This number is called $\cos x$
⋆To get $\cos x$divide the adjacent side of $x$by hypotenuse
To get $\tan x$ divide the opposite side by adjacent side x

4. If the radius of the circumcircle is Rthen $\sin D = \frac{BC}{2R} = \sin A$
$\frac{BC}{\sin A} = 2R$



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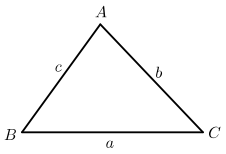
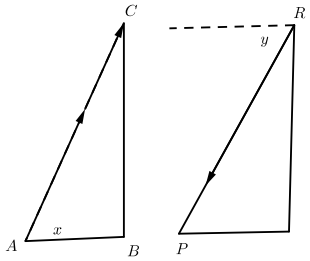
5. $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} = 2R$



■ The angles of a triangle determines the ratio of the sides
That means $a : b : c = \sin A : \sin B : \sin C$

6. The angle of elevation and angle of depression can be observed in the figures given below

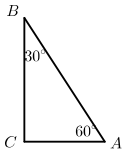


x stands for angle of elevation and y for angle of depression

Worksheet1

2

1. Complete the table given below



AB	BC	AC
		5
	4√3	
6		
	9	
		11
7		

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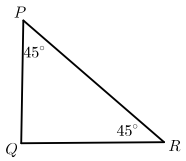
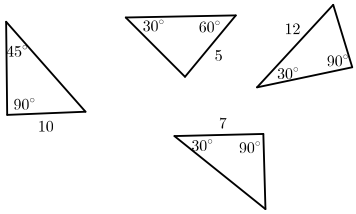
2. Complete the table given below



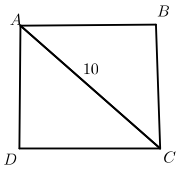
PQ	QR	PR
3		
	5	
		$11\sqrt{2}$
	8	
		9
7		

3

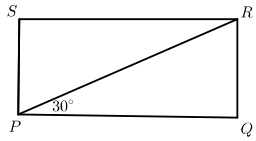
3. Calculate the perimeter of the triangle



4. $ABCD$is a square $AC = 10$cm .Find $\angle B$, $\angle BAC$Find the length of AB? Find the perimeter of the square



5. $PQRS$ is a rectangle . Find angle SPR? Find angle PRQ . If $PR = 30$then find PQ and QR . Calculate the perimeter of the rectangle .



6. If $CD = 5$then find $\angle ACD$, $\angle BCD$. Find AB, AD, BD, BC. Find the angles of triangle ABC.If the angles are $45°, 60°, 75°$ find the ratio of the sides ?

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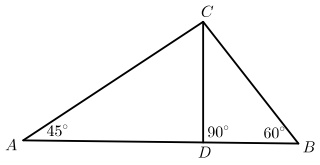
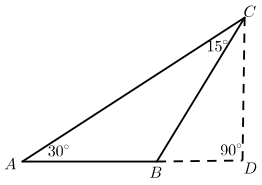
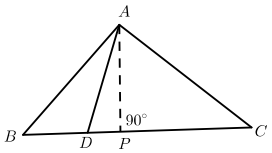


Worksheet 2

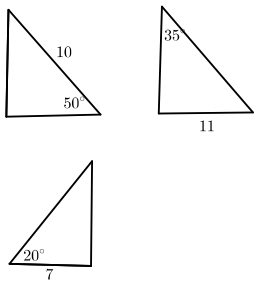
1. In the figure $BC = 12, \angle D = 90°$,Find $\angle CBD, \angle ACD, \angle ABC$.
   Find BD, CD, AD, AC, AB.
   Find the ratio of the sides of the triangle having the angles $30°, 15°, 135°$



2. In the figure $AD = 7, CD = 8, BD = 5, \angle ADP = 50°$then find ADB?If $\sin 50 = \frac{AP}{---}$ find AP?.Calculate the area of triangle ACD



3. Find the measure of the remaining part of the triangle from the figure given below



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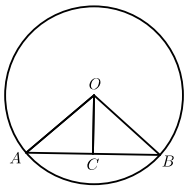
4. $\angle AOB = 2x$,radius of the circle R. Find $\angle AOC$?Find $\sin x$, AC and AB



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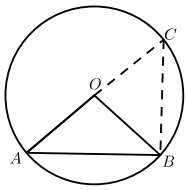
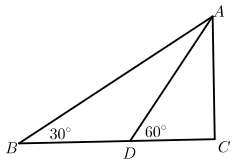
Worksheet 3

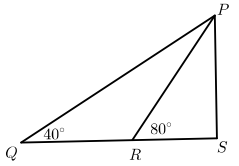
1. Using the figure find AB



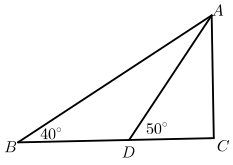
2. In the figure $BD = 10, \angle ADB$. Find $\angle BAD$,$AD, CD$and AC



3. In the figure $QR = 7$,find $\angle QRP, \angle QPR$. Find the length of PR ,$PS$and RS



4. In the figure $BD = 10, CD = x$find the length of BC,.Using $\tan 40, \tan 50$ find the length ofAC



5

Worksheet4

1. In triangle ABC, $AB = 7, BC = 12, \angle B = 40$. Find the area of the triangle. Calculate the length of AC
2. In the figure $AD = BD = CD = 5 \angle ADC = 50°$,find the area of triangle ACD, triangle $ABD$and triangle ABC

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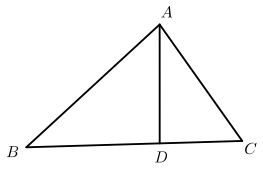
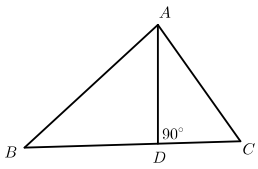
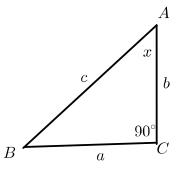


3. $ABCD$ is a parallelogram , angle $D = 120°, AB = 10, AC = 12$. Calculate the area of the parallelogram
4. One angle of a triangle is 30°, prove that radius of the circumcircle is equal to the side opposite to 30°
5. $O$is the center of a circle having a chord AB.AB= 12, angle$AOB = 120°$.Find the radius
6. A boy viewed the top of a tree at an angle of elevation 30°. He moved 10 m towards the tree and saw the top of the tree ant the angle 60° Find the height of the tree
7. In the figure$BC = 14, \angle B = 40°, \angle C = 50°$. Find the area of triangle ABC



Worksheet5

1. A child obsered an airoplane flying horizontally at the height 1km at an angle of elevation 60°at an instant.After ten seconds he saw the plane at the angle 30°. Calculate the speed of the plane
2. In the figure $\angle A = x$,find $\sin x, \cos x, \tan x$. Also find$\frac{\sin x}{\cos x}$.Find $\angle B$. Establish the relation $\sin(90 - x) = \cos x, \cos(90 - x) = \sin x$



3. In triangle ABC, $AC = BC, OA = 5, \angle AOB = 160°$then find$AB, AC, BC$.

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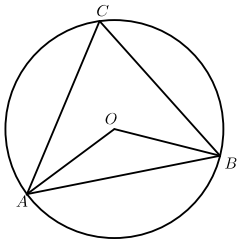
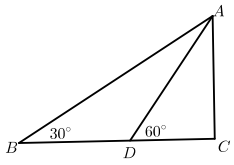
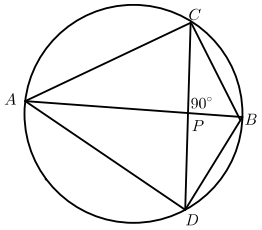


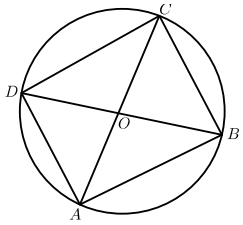
4. In the figure $BC = a, CD = b$prove that$a = 3b$



5. AB is the diameter of a circle, $PA = 9, \angle PAC = 30°$ find the radius of the circle, Find the sides of $ABCD$



6. in the figure O is the center of the circle , $OC = 5, \angle BOC = 60°$. Calculate the area of triangle BOC . Also find the area of triangle OCD?.Calculate the area of $ABCD$?



Worksheet 6

1. A man observed the top of a tower at a distance a from its base at an angle of elevation 60°. He saw the top of the tower at an angle of elevation 30° from a point at the distance b from the base.Prove that height of the tower $h = \sqrt{ab}$

2. If a, b, c are the sides and $A, B, C$are the angles opposite to them then prove that the area $A = \frac{1}{2}a \times b \sin C$

3. Establish the relation $a^{=}b^2 + c^2 - 2bc\cos A$
4. Using the relaions $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} = 2R$and $A = \frac{1}{2}a \times b\sin C$ prove that area of the triangle $A = \frac{abc}{4R}$

7

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4.Solids

Important Concepts

1. Square Pyramid

   - A square pyramid has a square base and four lateral faces . The lateral faces can be isoceles triangles or equilateral triangles. The sum of the areas of the these triangles is called lateral face area of the pyramid.lateral face area is the half of the product of base perimeter and slant height.The sum of the lateral face area and base area is called total surface area. Volume of the pyramid is one third of the base area and height
   - The slant height ,height and half of base edge form a right angle triangle Height , half of base diagonal and lateral edge makes a right triangle. The slant height , half of base edge and lateral edge form a right triangle
   - Cone
   - Base is a circle . Lateral surface is curved . Sum of these two makes the total surface area. Curved surface area is half the product of base pemimeter and slant height. Volume is one third of the product of base area and height
   - Slant height , radius and height form a right triangle
   - A cone can be made by folding a sectoral sheet of paper . While doing so, the radius of the sector becomes the slant height of the cone. The arc length of the sector becomes the base parimeter of the cone. Area of the sector becomes curved surface area of the cone
   - What fraction of the central angle of the sector is to 360° is equal to fraction of arc length of the sector to the perimeter of the circle from which sector is taken off .

2. Sphere and Hemisphere

   - A sphere has only one face. Its basic measure is radius . Curved surface area is the product of 4π and the square of radius . Volume of the sphere is $\frac{4}{3}\pi r^3$
   - A solid hemisphre has a curved surface and a circular plane surface. Curved surface area of the hemisphere is $2\pi r^2$, total surface area $3\pi r^2$, volume is $\frac{2}{3}\pi r^3$

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Worksheet1

1. The base edge of a square pyramid is 8cm , height 3cm .Calcualte slant height and lateral edge
2. Slant height of a square pyramid is 10cm , height 6cm .Calculate total length of the edges
3. The slant height of a square pyramid is 12cm , lateral edge 13cm .Calculate height
4. The length of base edge is 24cm, slant height13cm .Find height and lateral edge

Worksheet2

1. A sector is folded in such a way as to get a cone. Radius of the sector is 12cm , central angle 120°.Calculate radius and slant height
2. The central angle of a sector is 90°,radius 16cm , calculate slant heigt and radius
3. Slant height of a cone is 20cm , radius 10cm .What should be the radius and central angle of the sector
4. Radius of a cone is 4cm , slant height is $\frac{5}{2}$times radius . Calculate the radius and central angle of the sector

Worksheet 3

1. The base edge of a square pyramid is 6cm , height 4cm , calculate slant height and total surface area
2. The height of a square pyramid is 12cm , slant height 15cm , calculate total surface area and volume
3. The base perimeter of a square pyramid is 48cm . Slant height is 10cm .Calculate alteral surface area and volume
4. The height of a square pyramid is 15cm , volume 1620cm . Calculate total surface area

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Worksheet 4

1. The radius of a cone is 5cm, slant height 13cm . Calculate its height
2. The base area of a cone is 25πcm.curved surface area 165π . Calculate total surface area
3. Bae area of a cone is81π,height 12. Calculate volume
4. The height of a cone is 4cm, slant height 5cm . Calculate total surface area
5. Radius of a cone is 10cm, volume 3140cubic centimeter. Calculate total surface area

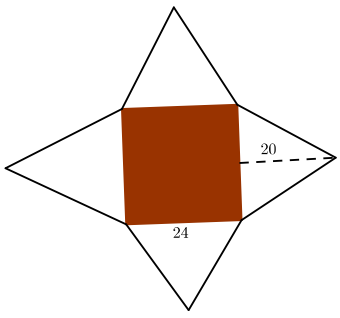
Worksheet 5

1. Calculate the surface area and volume of a sphere of radius3cm
2. Calculate the volume of a sphere of surface area 144π square centimeter
3. Calculate the surface area of a sphere of volume 972πcubic centimeter
4. What is the radius of a sphere having volume and surface area are equal numerically. How many small spheres of radius 1cm can be made by melting that metallic spheres
5. What is the change in volume and surface area of a sphere if its radius become three times

Worksheet6

3

1. The picture given below is drawn as an opened square pyramid



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⋆What is its slant height?
⋆What is its total surface area?
⋆ Calculate its volume ⋆What is the side of the square required to make this paper cutting shown in the figure

2. What is the volume of the largest square pyramid that can be carved from a wooden cube of volume 216cubic centimeter

3. A cone of largest size is carved from a wooden cylinder . If the volume of the cylinder is 1500π ,calculate the volume of the cone . If the height of the cylinder is 1cm, what is the height and radius of the cone

4. A cylindrical vessel has radius 3.5cm and height 20cm . It is filled with water. How many metal spheres of radius 3cm can be placed in it . Calculate the volume of water flows from the vessel

5. A cylindical vessel contains some water. A small sphere is immersed in it. Water level rises by a small amount.
Ammu said, if a sphere of the sphere is twice the first one ,the water level will raise twice. Can you agree with her opinion. Justify by suitable calculations

Worksheet7

1. The radius of a cone and a sphere are equal.If the height of the cone is four times radius, what is the ratio of their volumes.

2. A solid sphere of radius 7cm is melted and recaste into a cone of same radius of the sphere. Calculate the height of the cone

3. A sector of radius 15cm and central angle 144° is folded in such a way as to make a cone. What is the slant height of the cone. Calculate volume

4. Five sectors of central angles $120^\circ, 90^\circ, 60^\circ, 50^\circ, 40^\circ$and radius 30cm are taken from a circular plate. Calculate the radius of each one.What is the rati of their lateral surface areas

5. A wire of length 96cm is divided into some equal pieces and the ends are joined in such a way as to get the skelton of a square pyramid. What kind of triangle is its lateral face? What is its slant height?Calculate the area of the paper needed to cover the frame

6. The total surface area of a solid sphere is 120cm. It is split up into two hemipheres . Calculate their surface areas

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Worksheet 8

1. The angle opposite to the base edge of a square pyramid on its lateral face is 30°.Slant height is 20cm. Find lateral surface area
2. How many gold spheres of radius .1cm can be made by melting a solid gold sphere of radius 1cm?
3. The radius of a cone , hemisphere, cylinder and sphere are equal height of cone and cylider are equal to radius . Prove that volumes are in an arithmetic sequence

5

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5.Coordinates

Important Concepts

1. A point in a plane can be specified by a pair of real numbers based on two perpendicular straight lines and a scale for measuring distance
2. The perpendicular lines are coordinate axes and the point of intersection of these lines is called origin. Coordinates of origin is denoted by $O(0, 0)$.
3. If a point in a plane is denoted by (a, b),a stands for $x$coordinate and $b$for $y$coordinate.
4. y coordinates of all points on x axis is zero . A point on x axis is taken as $(x, 0)$
5. $x$coordinates of all points on y axis is zero. A point on y axis is taken as $(0, y)$
6. The $y$coordinates of all points on a line parallel to x axis are equal . The $x$coordinates of all points on a line parallel to y axis are equal
7. The distance between any two points on x axis or any line parallel to x axis is the absolute value of the difference between their $x$coordinates
8. The difference between any two points on y axis or on a line parallel to y axis is the absolute value of the difference between their y coordinates .
9. The distance between $A(x_1, y_1), B(x_2, y_2)$ is $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Worksheet1

1. Drawx, yaxis and mark the points $A(0, 5), B(0, -2), C(4, 0), D(-3, 0), E(4, 5), F(-3, -$
2. What are the points on x axis , on y axis?
3. Write dinates of two more points on AE
4. Write the coordinates of two more points on CE

Worksheet2

1. Given $A((2, 3), B(5, 4), C(6, 7), D(3, 6)$. Find the lengths AB, BC, CD, AD.

2. Check whether $AC = BD$ or not
3. Prove that $P(4, 5)$ the point on $AC$and BD
4. Find a point on x axis equdistant from A and B

Worksheet 3

1. The sides of $ABCD$are parallel to the coordinate axes and $A(3, 7), C(7, 9)$ are the opposite vertices . Write the coordinates of B and$D$
2. Find the lengths of AB and BC
3. Calculate the area of the rectangle $ABCD$
4. If P, Q, R, S are the mid points of the sides , write the coordinates ofP, Q, R, S
5. Calculate the sides of $PQRS$.
6. Suggest a name suitable to $PQRS$

Worksheet4

1. If $A(4, 3), B(-4, 3)$ are two points on the line AB write two more points on this line
2. Write the coordinates of two more points on the line perpendicular to AB and passing through $(4, 3)$
3. Find the length AB
4. Write the coordinates of the mid point of AB

Worksheet 5

[2]

1. Without drawing coordinate axes mention the positions of $A(2, 1), B(6, 1), C(6, 5)$ as left -right, above -below
2. Draw coordinate axes, mark the points and complete triangle ABC
3. Which side of the triangle is parallel to x axis

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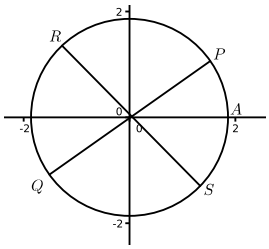
4. Which side is parallel to $y$axis
5. write the coordinates of the mid point of AB
6. Write the coordinates of the midpoints of BC
7. write the coordinates of the midpoits of AC

Worksheet6

1. $A(6,0)$ is a point on a circle with center $(0,0)$.Find the radius of the circle
2. Show that $B(-3,3\sqrt{3}$,$C(-3,-3\sqrt{3}$are the points on this circle
3. Find the lengths AB, BC, AC
4. Find $\angle AOB$

Worksheet7

1. In the figure $(4,0)$ is the coordinates of A, PQ and RS are two perpendicular diameters , $\angle AOP = 45°$. Write the coordinates of P, Q, R, S



2. The center of the circle with radius 5 is at the origin .(a,b) is a point on the circle . Prove that $a^2 + b^2 = 25$. Write the coordinates of eight points on this circle
3. In triangle ABC,$A(-3,4), B(6,4), C(3,12)$.
   $\star$ Find BC
   Find $\star$ Find the altitude from $C$to AB
   $\star$ Calculate the area of triangle [3]
4. If$A(1,3), B(3,6), C(5,9)$then
   $\star$ Find AB, BC, AC
   $\star$ Check whether A, B, C are the ponts on a line or not
   $\star$if $BC = CD, BC + CD = BD$then find the coordinates of B
   $\star$ Find the point $10\sqrt{13}$cm away from A on AB.

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6. Second Degree Equations

Important Points

1. Solving equations of the form $x^2 = a$
2. Solving equations by completing the square
3. Making equations from various situations and the process of solving those equations
4. Soving the equations by a formula

Worksheet 1

Calculate in your mind and write the answer.

1. The square of a counting number is 2. What is that number ? Write two numbers whose square is 25
2. When the square of a number is added to the number we get 30. What are the numbers ?
3. Find the side of the square whose area and perimeter are numercally equal
4. How many odd numbers from 1makes the sum 961?
5. A boy put one rupee in the first day in a box . He put 2 rupees in the second day 3 rupees in the third day and so on. After some days he put one rupee less in the subsequent days . At last he put 1 rupee and then opened the box. He found that the amount in the box is exactly in between 900 and 1000. What is the actual amound in the box. How many days he continued this process
6. A man's age after 15 years will be the square of his age 15 years ago. What is his present age?

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Worksheet2

Form the equation

1. The sum of a number and its square is ten times that number .
2. The sum of a number and its square root is 6
3. The sum of first n natural numbers is 210.
4. The area of a rectangle whose length is 5 more than its width
5. The sum of a number and its reciprocal is $\frac{5}{2}$
6. The sum of even numbers from 2 in an order is 240
7. A man's age after 15 years will be the square of his age 15 years ago .

Worksheet 3

Solve the equation by completing the square

1. When 8 times a number is added to its square we get 8.Find the number by making the equation properly
2. Which term in the sequence$2, 5, 8 \cdots$ gives its square 2500?
3. A man's age after 15 years will be the square of his age 15 years ago. Find the age
4. The length of a rectangle is 2 more than its width. Area of the rectangle is 80. Find length and breadth
5. The sum of a number and its reciprocal is $\frac{5}{2}$. Find the number
6. The sum of some even numbers starting from 2 is 420. Find the number of even numbers added

Worksheet 4

[2]

1. Sum of the squares of three consecutive natural numbers is 110. 110 .
2. The product of the digits of a two digit number is 12.When 36 is added to the number we get a two digit number in which the digits are reversed . Find the two digit number .

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3. Serena and Johan had 45 diamond stones. They sold 5 stones . The product of the remaining stones is 124. Find the number of stones each had
4. The sum of a number and its reciprocal is $1\frac{1}{2}$. Find the number.
5. The sum of two numbers is 15. Sum of its reciprocals is $\frac{3}{10}$.Find the numbers
6. The square of the difference between two numbers is 45. Larger number is 4times the square of small number. Find the numbers
7. A two digit number is four times sum of its digits. The number is three times product of the digits. Find the number

Worksheet5

1. A train travels a distance of 300km at a constant speed. If the speed of the train is increased by 5km, the journey would have taken 2 hours less. Find the original speed of the train
2. The speed of a boat in still water is 15km per hour. It can go 30km upstream and return downstream to the original point in 4 hours 30minutes.Find the speed of the boat
3. An express train takes 3hours less than a passanger train for a journey of 600km. If the speed of the passanger train is 10 less than the speed of the express train find the speeds of both trains (Use pythagorous theorem in distance, not in speeds)

[3]

Worksheet6

1. One year ago a man's age is eight times the age of his son .At present man's age is the square of son's age. Find the present age.
2. The product of Ramu's age before 5 years and his age after 9 years is 15. Find his present age
3. The sum of the ages of a man and his son is 45The product of their age before 5 years is 124. Find their present age
4. A man's age after 15 years will be the square of his age 15 years ago . Find the present age by forming second degree equation

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5. The product of Layas's age before 5 years and after 5 years is 30 . Find the present age.

Worksheet 7

1. Sravani teacher asked the students to construct a rectangle having area 5 square unit and perimeter 8. Jeevan , a wise student of the class , after making some calculations told that it is not possoible to construct such a rectangle. Can you agree with him . Justify reasonably
2. The perimeter of a rectangle is 4cm, area 60square centimeter Find the sides
3. The length of the rectangle is 4 more than its breadth . Area of the rectangle is 140square centimeter. Calculate length and breadth
4. When the sides of a square are increased by 4, area become 140. 4 256 . ?
5. The area of a right angled triangle is 60square unit. The one of the perpendicular sides is 10more than other . Find the sides of the triangle
6. The area of an isoceles triangle is 60square meter. One of the equal sides is is 13cm. Find the third side. Take base x then $h = \sqrt{13^2 - x^2}$.
7. A man bought some books of same price for 80 rupees. If he had bought four more books in this amount each book would have cost 1 rupee less. How many books did he buy?

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7.Geometry and Algebra

Important Concepts

[1]

1. If A, B, C, are the vertices of the parallogram , its fourth vertex Dcan be determined by noting the shift of coordinates. The shift of x coordinates of $A$and B is same as the shift of x coordinates of C and D. Similary in the case of y coordinates

2. If $P(x, y)$ divides the line joining $A(x_1, y_1), B(x_2, y_2)$in the ratio $m : n$ then

$$x = x_1 + \frac{m}{m+n}(x_2 - x_1)$$

$$y = y_1 + \frac{m}{m+n}(y_2 - y_1)$$

3. $P(x, y)$ is the mid point of the line joining $A(x_1, y_1), B(x_2, y_2)$then

$$x = \frac{x_1 + x_2}{2}, y = \frac{y_1 + y_2}{2}$$

4. For any line not parallel to the coordinate axes the change of y coordinates and x coordinates between any two points are proportional . This proportionality constant is known as slope of the line.

5. The slope of the line is the *tan* measure of the angle made by the line with the positive direction of x axis

6. The slopes of parallel lines are equal.

7. The product of the lines perpendicular to eachother and not parallel to the coordinate axes is -1

8. The algebraic form of the relation between coordinates of a point in a line is called the equation of the line .

9. The equation of the circle with center $(0, 0)$ and radius r is

$$x^2 + y^2 = r^2$$

.

10. The equation of the circle with center $(a, b)$and radous r is

$$(x - a)^2 + (y - b)^2 = r^2$$

.

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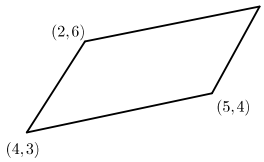
Worksheet 1

[2]

1. If$A(2,-1), B(3,4), C(-2,3)$are the vertices of a triangle find the fourth vertex
2. If $A(4,5), B(7,6), C(4,3)$are the three vertices of a parallelogram $ABCD$ write the coordinates of the fourth vertex
3. In triangle ABC,$(4,2)$ is the mid point of AB.The mid point of BC is $(5,4)$,the mid point of AC is $(3,3)$. Find the vertices of the triangle
4. The verticesof a triangle are given.



   Find the coordinates of the fourth vertex
5. If the points $A(2,-2), B(14,10), C(11,13)$arethe three vertices of a rectangle find the fourth vertex

Worksheet 2

1. Find the coordinates of the point which divides the line joining $(4,-3),(9,7)$in the ratio $3:4$
2. Find the coordinates of the midpoint of the line joining the points $(1,-2),(-3,4)$
3. The points $A(6,1), B(8,2), C(9,4), D(p,3)$are the vertices of a parallelogram . Find the value of p using the concept that the diagonals of a parallelogram bisect eachother
4. one end of the diameter of a circle is $(1,4)$. The center of the circle is $(3,-4)$. Find the coordinates of other end
5. Find the coordinates of the points P and$Q$ which trisect the line joining $(2,-3)$ and $(4,-1)$.
6. Prove that $A(6,4), B(5,-2), C(7,-2)$ are the vertices of an isosceles triangle. If D is the mid point of the side BC,find the coordinates of D. Calculate the length of this median . Also find the coordinates of centroid
7. The center of a circle is $(\frac{4}{3},-2)$. $(3,2)$is one end of the diameter . Find the coordinates of the other end

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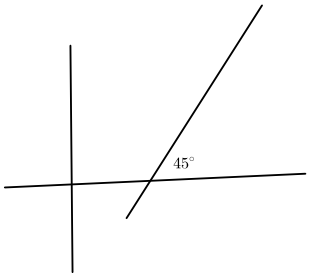
8. $A, B, C$are three points on a line . $AB = BC$, $A(3, a), B(1, 3), C(b, 4)$are the points . Find a, b

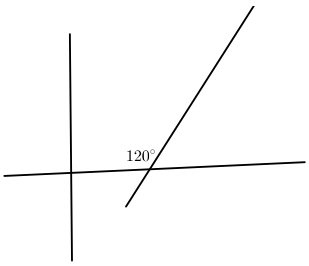
[3]

Worksheet 3

1. A line makes an angle $45°$ with x axis .Find the slope of the line



2. The points on a line are $(-1, 1), (3, 1), (5, 1)$
   What is the angle made by this line with $x$axis? What is the slope of this line
3. Find the slope of the line passing through $(1, -3), (3, -5)$
4. A line passing through a point at a distance 4 from the right of origin on x $x$axis . If $(3, 4)$ is a point on this line , find the equation of the line
5. If a line cut x axis at $(5, 0)$ and y axis at $(0, -3)$. Find the slope of the line
6. Find the slope of the line given below



7. The slope of the line passing through $(1, y), (2, 5)$is 2. Find the value of y

Worksheet4

1. Prove that the points $(1, 3), (2, 5), (3, 7)$ are on a line
2. Find the coordinates of two more points on the line joining $(-1, 4), (1, 2)$

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3. The numbers in the sequence $2, 5, 8, 11 \cdots$ and the numbers in the sequence $7, 11, 15, 19 \cdots$ are joined pair wise as given below
   $(2, 7), (5, 11), (8, 15) \cdots$
   Prove that these are on a line.

4. Find the slope of the line passing through $(-2, 3), (5, 7)$. Write the slope of the line parallel to it

5. Prove that the line passing through $(2, -3), (-5, 1)$is parallel to the line passing through $(7, -1), (0, 3)$

6. prove that the diagonals of a square are perpendicular to each other
   (Draw axes , mark the poinst $(0, 0), (a, 0), (a, a), (0, a)$, find the slopes of digonals , finds its product4

Worksheet5

4

1. Prove that the line passing through $(2, -3), (-5, 1)$is perpendicular to the line passing through $(4, 5), (0, -2)$

2. Draw the axes and mark the points $(0, 0), (4, 0), (7, 6), (3, 6)$. Join these points in an order. Suggest a suitable name for this quadrilateral. Prove that the diagonals are perpendicular.

3. The points $A(-4, 2), B(2, 6), C(8, 5), D(9, -7)$are the vertices of a qudrilateral . Write the coordinates of the midpoints of the sides. Join the midpoints in an order. Prove that it is a parallelogram

4. Prove that the line passing through $(3, y), (2, 7)$is parallel to the line passing through $(-1, 4), (0, 6)$

5. Prove that the line joining the points $(8, 2), (-5, 3)$ is neither parallel nor perpendicular to the line passing through the points $(16, 6), (3, 15)$

Worksheet6

1. Write the equation of the line passing through the points$(1, 1), (2, 2), (3, 3)$

2. Write the equation of the line passing through the points $(1, 3), (2, 5), (3, 7)$

3. Find the equation of the line passing through $(5, 1), (1, -1), (11, 4)$

4. $(3, 0)$is a point on the line joining the points $(3x^2, 6x), (3y^2, 6y$ then prove that $xy = -1$

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5. Sum of the x coordinates of the points where a line cut axes is 0. If $3, 4)$ is a point on this line find the equation of the line

Worksheet 7

1. The sum of the $x$coordinates of the points where the line cut x axis is 14. If$(3, 4)$ is a point on it, find the equation of the line
2. If a line passing through $(1, 1)$This point divides the segment between axes in the ratio $3 : 4$. Find the equation of this line
3. Prove that the points equdistant from the points $(3, 4), (-1, 2)$ lie on a line
4. Prove that the equation of the line passing through $(2, 0), (0, 3)$is $\frac{x}{2} + \frac{y}{3} = 1$
5. Find the equation of the line passing through the points $(2, 3), (-1, 2)$. Write the equation of three lines parallel to it
6. If the point (x_1, y_1)bisect the segment of the line in between the axes then prove that $\frac{x}{x_1} + \frac{y}{y_1} = 2$

Worksheet8

1. Calculate the slope of the line $2x + 3y - 6 = 0$ by taking the points where the line cut axes
2. Find the equation of the line parallel to $2x + 3y - 6 = 0$and passing through $(1, 1)$
3. Find the slope of the line $2x + 3y - 6 = 0$. Find the equation of the line perpendicular to this line and passing through $(1, 1)$
4. Find the coordinates of the point of intersection of the lines$5x + 7y - 3 = 0, 2x - 3y - 7 = 0$
5. If the lines $3x - by + 2 = 0, 9x + 3y + a = 0$ are parallel ,find the value of $a, b)$
6. Prove that the lines $x - y - 1 = 0, 4x + 3y - 25 = 0, 2x - 3y + 1 = 0$passing through the same point
7. Find the coordinates of the vertices of the triangle formed by the lines $7x - 2y + 10 = 0, 7x + 2y - 10 = 0, y + 2 = 0$. Calculate its area

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Worksheet9

1. Name the geometric figure represented by the equation $x^2 + y^2 = 1$. What is its speciality?
2. Find the equation of the circle passing through $(2, 3)$ and center at the origin
3. Find the equation of a circle passing through $(3, 4)$ and radius 2.
4. Write the equation of the circle with center$(0, 0)$and radius 5. $(3, 4)$ is a point on this circle. Find the slope of the line joining center and the point $(3, 4)$. Write the equation of the tangent to the circle at this point
5. Find the center and radius of the circle $x^2 + y^2 - 4x - 4y + 4 = 0$.
6. Find the equation of the circle having $(2, 1), (1, -6)$as its end points of the diameter
7. Find the equation of the circle with center$(-1, 2)$ and radius $\sqrt{5}$
8. The radius of the circle $x^2 + y^2 + 8x + 10y + p = 0$ is 7. find the value of p

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8. Statistics

Important Concepts

1. Median is the middle observation of the data arranged in the ascending order . For example, if the median of the heights of 9 students in a class is 140, we meant that there are 4 students whose heights below 140 and 4 students above 140.

2. The workers of a company are listed below according to their wages . Calculate mean wage

വരുമാനം	തൊഴിലാളികളുടെ എണ്ണം
500 -540	4
540 - 580	5
580 -620	6
620 -660	8
660 -700	8
700 -740	5
740 -780	3

The number of workers is 39.If the workers are arranged according to their wage, the wage of the worker comes in the middle is median.
That means the wage of 20th worker is median
.
Here the number of workers below 540 is 4.
The number of workers below 580 is 9.
The number of workers below 620is 15
The number of workers below 660is 23
From this it is clear that 20th worker has the wage in between 620 and 660. There are 8 workers in this group.
Let us divide this into 8 sub divisions.These subdivisions are $620-625, 625-630, 630-635, 635-640, 640-645, 645-650, 650-655, 655-660$ .The wage of 16 th worker is in the middle of $620-625$. That is , the wage of that worker is 622.5.
The wage of 17 worker is 627.5.
So the wage of 20th worker is 642.5 642.5
This is median . Note that $622.5, 627.5, 632.5 \cdots$ are in an arithmetic sequence

Worksheet1

1. The members of a football team is arranged according to their height. Calculate median

ഉയരം സെ.മീറ്റർ	കുട്ടികളുടെ എണ്ണം
120-126	2
126-132	3
132-138	6
138-144	3
144-150	1

2. The marks obtained by the students of XA are given below. Calculate median

മാർക്ക്	എണ്ണം
10--20	6
20--30	7
30--40	8
40--50	10
50--60	7
60--70	4
70--80	3

3. The weights of some children are arranged as given below . Calculate median

ഭാരം	എണ്ണം
40.5-45.5	5
45.5-50.5	7
50.5-55.5	10
55.5-60.5	8
60.5-65.5	4

4. The workers of a company are arranged as given below . Calculate median

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വരുമാനം	തൊഴിലാളികളുടെ എണ്ണം
450	2
500	3
550	5
600	8
650	6
700	5
750	1

3

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9.Polynomials

Important Points

1. If$p(x) = q(x) \times r(x)$then $p(x)$has the factors $q(x), r(x)$
2. If$(x - a)$is a factor of $p(x)$then $p(a) = 0$
3. If $(x - a)(x - b) = 0$then $x - a = 0$or $x - b = 0$
4. If$p(x) = (x - a)(x - b)(x - c)$then $p(x) = 0$ has the solutions a, b, c
5. If $p(x)$is divided by $(x - a)$, $p(a)$will be the remainder
6. $(a + b)^2 - 4ab = (a - b)^2$, $(a - b)^2 + 4ab = (a + b)^2$ [1]

Worksheet1

1. Write the product $(x - 1) \times (x + 1)$
   Find the product of $(x - 1), (x + 1), (x + 2)$
   If the poduct is $p(x)$find $p(1), (-1), p(-2)$
   Write the solution of the equation $p(x) = 0$
2. Expand $(x - a)(x - b)$
   If $x^2 - 7x + 12 = (x - a)(x - b)$then find $a + b$. Also find ab
   Calculate the values of a, b
   Write the factors of $(x^2 - 7x + 12$
   Find the solutions of $(x^2 - 7x + 12$
3. $p(x)$is a third degree polynomial. $p(1) = p(2) = p(-2) = 0$.Write the factors of $p(x)$.
   Write the product of the factors in the form of a third degree polynomial
4. If $p(x) = x^3 - 6x^2 + 11x - 1$ then find $p(1), p(2), p(3)$
   Find $p(x) - p(1), p(x) - p(2), p(x) - p(3)$
   $p(x) - p(1)$. Write the solutions of $p(x) - p(1) = 0$
5. When $p(x)$is divided by $(ax + b)$, the quotient is $q(x)$and the remainder is c
   $p(x) = (ax + b) \times q(x) + c$
   When does the value of $p(x)$equal to c
   $p(\frac{-b}{a}) = (a \times \frac{-b}{a} + b) \times q(\frac{-b}{a}) + c$
   What is the remainder when $p(x)$is divided by $ax + b$
   When does $(ax + b)$become the factor of $p(x)$

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Worksheet2

1. Write the following as the product of first degree polynomials
   - $x^2 + 7x + 12$
   - $x^2 + 3x + 2$
   - $x^2 - 9x - 22$
   - $2x^2 + 5x - 3$

2. Write a polynomial $p(x)$ in which $p(1) = 0, p(-2) = 0, p(2) = 0$
3. Write a second degree polynomial $p(x)$ in which $p(\sqrt{2}+1) = p(\sqrt{2}-1) = 0$
4. Find the remainder obtained by dividing $x^3 - 6x^2 + 11x + 5$by $(x-1), (x+1), (x-1)(x+3), (2x-1), (2x+1)$. Write a third degree polynomial in which $x2$ is a factor
5. prove that x^2+2x+2cannot be written as the product of first degree polynomials

Worksheet3

1. Find the remainder and quotient obtained by dividing x^3−5x^2+7x+3by $(x+2)$.
2. Find $p(1)$ in the polynomial$p(x) = x^3 - 4x^2 - 7x + 10p(1)$. If $p(x) = (x-1) \times q(x)$then find $q(x)$.
   Write $q(x)$as the product of two first degree polynomials
3. If $p(x) = x^3 + ax^2 + bx - 3, p(1) = 0, p(2) = 15$then find a, b. Write $p(x)$ as the product of three first degree polynomials
4. Given $x - 1$ is a factor of $x^2 + ax + b$. Prove that $(a + b = -1)$
5. $p(x) = (4x^2 - 1)(x + 2)$Write $p(x)$as the product of first degree factors.Write $p(x)$ in the form of a trird degree polynomial
   What is the remainder obtained by dividing $4x^3 + 6x^2 - x + 2$by $(x + 2)$
   What is the remainder obtained by dividing $4x^3 + 6x^2 - x + 1$by$(2x - 1)$

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10.Mathematics of Chance

Important Concepts

1. There are experiments whose output cannot be predicted accurately.Tossing a coin is an example of this experiment
2. While explaining the chance numerically, probabilty is the ratio of the number of favourable outcome and the number of possible outcomes

[1]

Worksheet1

1. How many odd numbers are there below 25
2. How many prime numbers are there below 30
3. Find the number of two digit even numbers
4. How many two digits perfect squares are there
5. Write all three digit numbers can be written using the digits $3, 6, 8$without repeating the digits
6. How many multiples of 7 are there in between 100and 300 ?
7. There are 50 children in a class.Thirty of them are boys. There are 40 children in another class. 25 of them are boys . One student is taken from each class at random. What is the number of outcomes ? How many outcomes contain both boys. How many outcomes contain both girls. How many outcomes have one boy and one girl.

Worksheet2

1. A fine dot is placed into the picture without looking into it. What is the probability of falling the dot in the small semicircle.What is the probability of falling the dot outside the small semicircle but inside the big semicircle

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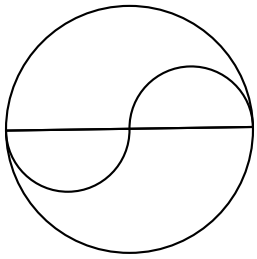
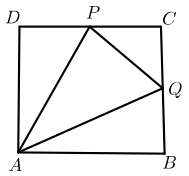


2. P, Q, R are the mid points of the sides of triangle ABC. Another triangle is drawn by joining these points. A fine dot is placed into the figure without looking into the picture. What is the probability of falling the dot in triangle PQR.
   What is the probability of falling the dot outside the triangle .
3. What is the probability of occuring 53 days in a leap year
4. You can see a triangle inside a square. $ABCD$ is a square. P, Q are the midpoints of CD and CB. A fine dot is placed into the figure without looking into the figure. What is the probability of falling the dot in triangle APQ.



5. The value of $2^1, 2^2, 2^3 \ldots 2^{50}$are written in small papers and put it in the box. A paper is taken at random. What is the probability of getting a number having 4 in ones place. What is the probability of falling 8 in the one's place.

2

worksheet3

1. Numbers from 1 to 10 are written in small papers and placed in a box .One number is taken from the box at random. What is the probabilty of getting a prime number.
2. Two boxes contains tokens on which numbers $1, 2, 3, 4$ are written One token is taken from each box. What is the probabilty of getting sum of the face numbers a prime number
3. One box contains 8 black balls and 12 white balls. Another box contains 9 black and 6 white balls. one ball is taken from each box at random. What is probability of getting both black. What is the probabilty of getting both white. What is the probability of getting one black and one white?

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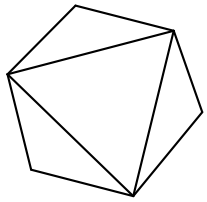
4. In the gigure a triangle is drawn by joining the alternate vertices of a regular hexagon.A fine dot is placed into the figure at random. What is the probability of falling the dot in the triangle.



5. What is the probability of occuring four wednesdays in 23 consecutive days in a month [3]

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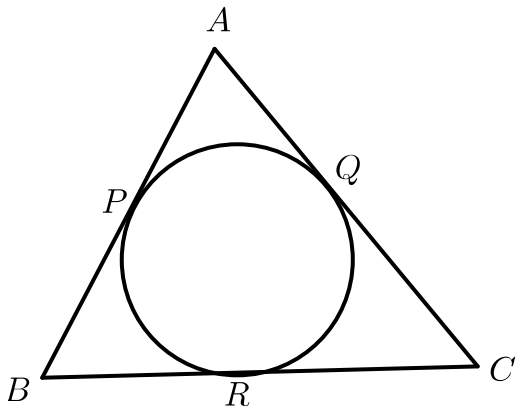
S.S.L.C Practice Paper 2017

$2\frac{1}{2}$hour Score80

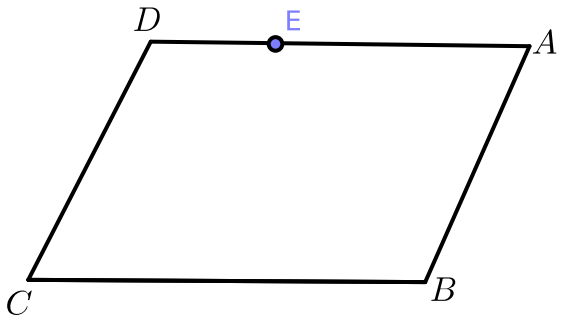
Mathematics

- Read the queations carefully and answer it with necessary steps
- Give proper explanations in the answers if neceessary
- If *or* comes between two questions , write only one among them
- 15minutes is allowed as cool of time
- If not mention specifically , it is not necessary to simplify the answers using the values of$\sqrt{2}, \pi$

1. The first term of an arithmetic sequence is 17 and its common difference 8.Is 2017 a term of this sequence?
2. The solutions of the equation $x^2 - 2x - 24 = 0$are6and -4. If $P(x) = x^2 - 2x - 24$ then find $P(-4)$. Write the factors of $P(x)$
3. O is the incenter of triangle ABC . The incircle touches the sides at P, Q, R. $\angle POQ = 110°, \angle C = 60°$. Find $\angle B, \angle POR$.



4. In the parallelogram $ABCD$, $A(6, 4), B(15, 4)$. $E(9, 10)$ is a point on CD. Find the length of AB. Calculate the area of the parallelogram



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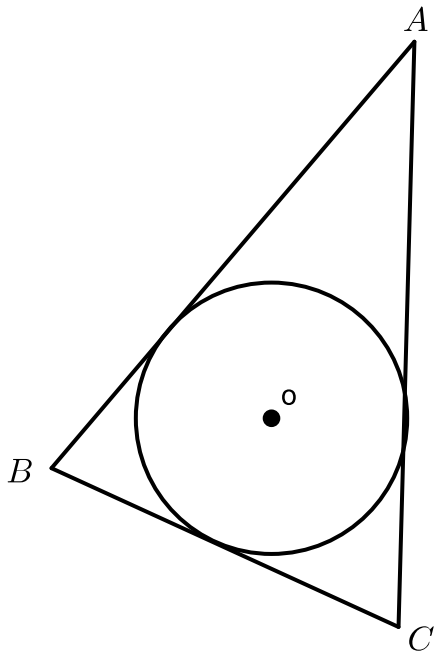
5. Calculate median and mean
   $470, 520, 390, 445, 505$

6. O is the center of the incircle of triangle ABC. Radius of the circumcircle is 60cm. Which of the following is AC



   $a)6\sin B$ $b)\ 12\sin \angle ABC$ $c)\ 6\sin \frac{\angle ABC}{2}$ $d)\ 12\sin B$
   If the side BC makes an angle 60°at the center,find the length of BC.

7. Calculate the central angle of the sector which can be used to make a cone whose slant height is two times radius. Calculate the central angle of the sector thatcan be used to make a cone whose slant height is $2\frac{1}{\lfloor}2$times radius

8. The sum of the first 30 terms of an arithmetic sequence is 90 more than the sum of the first 29 terms. Its 20 th term is 60. Calculate 30th term. Can the difference between any two terms 2017.

   or

   The tenth term of an arithmetic sequence is 40. Eighteenth term is 88. Calculate common difference. Is 168 a term of this sequence. Why? Write the algebraic form of the sequence
   .[2]

9. O is the center of a circle.$\angle AOB = 100°$.Find angle A. Find angle D? Find angleDAB

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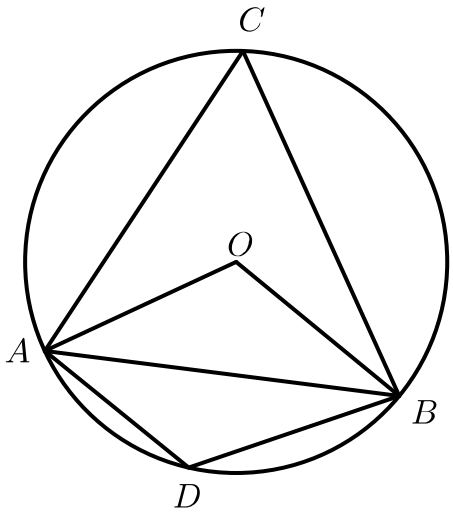

10. When the square of a number is added to one more than ten times that number we get 300. Calculate the number [3]

11. The algebraic form of an arithmetic sequence is $8n + 6$. Write the sequence. Write the algebraic form of the sum. Can the sum of some terms from the beginning 468?

12. Construct a rectangle with sides 7cm and 3cm . Construct a square whose area equal to area of this rectangle .

13. Two children are asked to tell counting number below 15.What is the probability of telling both children same number.
    What is the probability of telling the numbers whose sum 27 or above? What is the probability of telling the numbers whose product a multiple of 10

14. O is the center of a circle with diameter AB. Given that $A(2, 6)$, $B(10, 12)$
    Find the coordinates of the center.
    What is the radius of the circle.
    P is a point on this circle. $PA = PB$. Write the coordinates of P

15. Draw a circle and mark a point A on the circle.Draw the tangent to A and mark the point P such that $PA = 6$. Draw a square with side PA. Construct a rectangle with one side 8 and area equal to area of the square.

16. Calculate the median from the data

ഭാരം	എണ്ണം
40.5-45.5	5
45.5-50.5	7
50.5-55.5	10
55.5-60.5	8
60.5-65.5	4

17. The radius of a circle is 15cm. P is a point on the chordAB. The lengths of AP and PB are counting numbers. $PA \times PB = 34$, CD is another chord passing through P.
    What is $PA \times PB$
    If $PC = 10$, find PD
    Can PC, PDbe counting numbers ? Why?

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18. Check whether $(x-2)$ a factor of $p(x) = x^3 - 3x$. What first degree polynomial should be added to this polynomial which gives another polynomial in which $(x-1)$ and $(x-2)$ are the factors

19. A circle is drawn by taking the line joining the points $(4, 6)$, $(0, 2$ as the diameter. Write the equation of the circle

20. In triangle PQR, $PQ = PR$,$\angle Q = 50°$. Find angle R. Find angle P. Find the angles of triangle ABC where this triangle is formed by joining the points at which the incircle touches the sides of triangle PQR

21. A hemisphere of same radius of a cyclinder is carved from one end of the cylinder. A cone of same radius and 6cm height is carved from the other end. Given that the length of the cylinder is 12cm and radius 3cm. What is the diameter of the cylinder ? calculate the volume of the cylindrical part after removing both solids

22. A man standing on the top of a tower observes the top of a building of height 10meter at an angle of depression 30°. He saw the bottom of the tower at the angle of depression 60°. Calculate the height of the tower

23. Can $(3, 4), (5, 16), (7, 24)$ be the vertices of a triangle?Why?
    If (x, y) is a point on the line joining first two points then prove that $(x + 1, y + 1)$ is a point on the same line [4]

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