

NALANDA COLLEGE - COLOMBO 10

Grade 11

Mathematics

Third Term

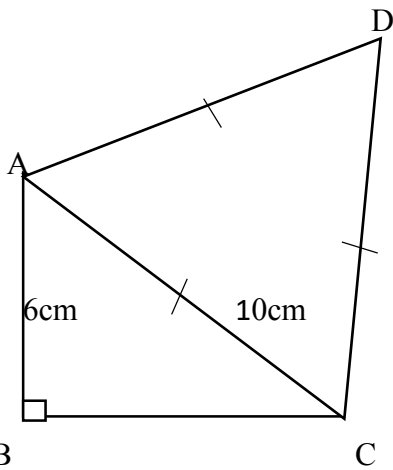
Unit Test



17) Pythagoras' Theorem

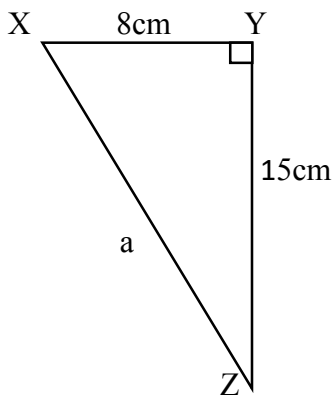
Part I

1. Find the perimeter of the quadrilateral ABCD.



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According to the data in the figure, find the value of a.

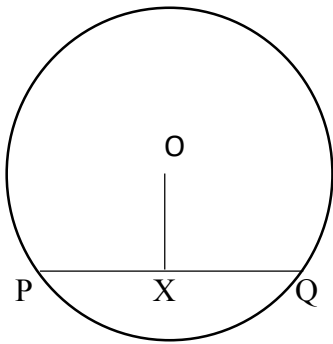


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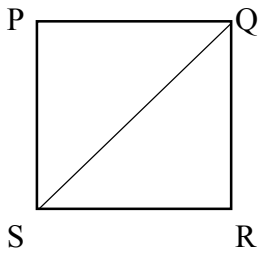
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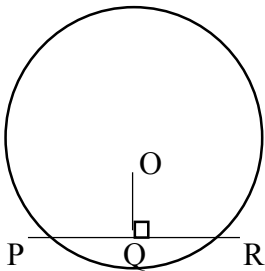
3. In the circle with the centre O, PQ is a chord. If $PQ=6\text{cm}$ and $OX=4\text{cm}$ find the radius of the circle.



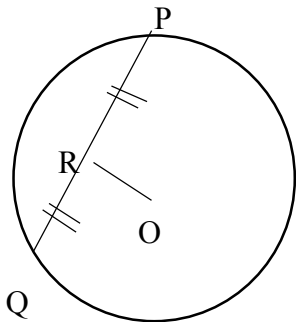
4. PQRS is a square, if the length of diagonal SQ is $6\sqrt{2}\text{ cm}$ find the area of the square.



- The radius of the circle with centre O is 15cm. OQ is the perpendicular to the chord PR from O. $OQ=9\text{cm}$. Find the length of the chord PR.



6. In the circle with centre O, the length of the chord PQ is 10cm. $PR=RQ$ and $OR=12\text{cm}$. Find the radius of the circle.

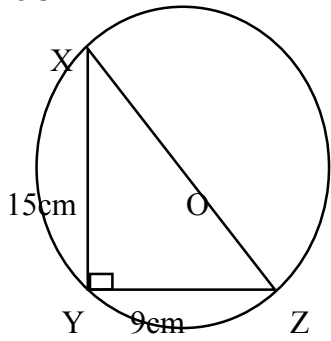


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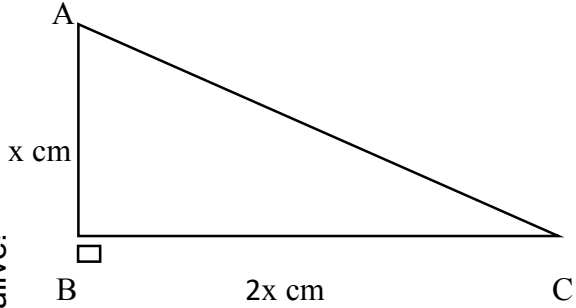
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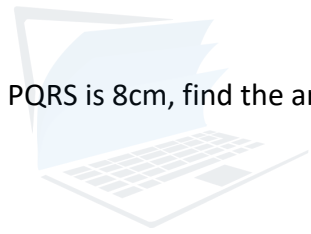
7. X, Y and Z are three points on the circle with the centre O. XY=15cm and YZ=9cm. Find the radius of the circle.



8. ABC is a triangle with $\hat{A} \hat{B} C$ a right angle. Show that $AC = \sqrt{5} x$ cm.



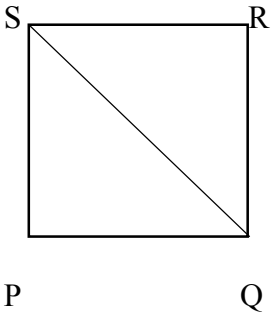
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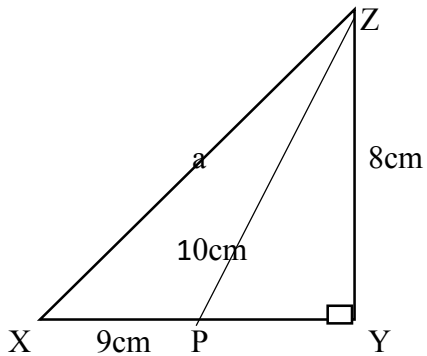
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9. If the length of the diagonal SQ of the square PQRS is 8cm, find the area of the square.

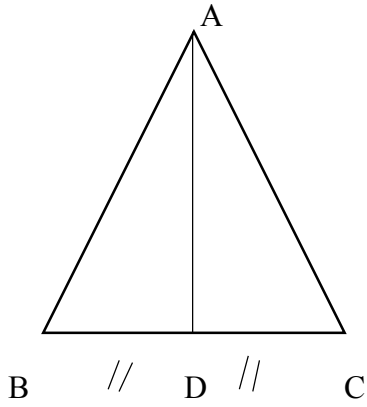


10. According to the data in the figure, find the value of a.

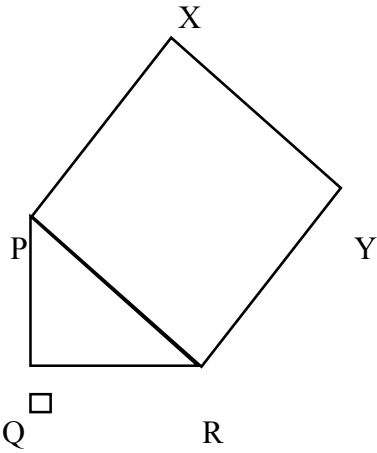




1. ABC is an equilateral triangle, D is the midpoint of BC. Show that $4AD^2 = 3BC^2$.

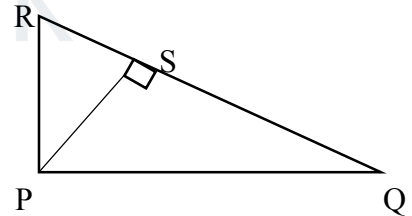


2. PQR is a right angled triangle and PRYX is a square. If $PQ=QR$, Show That,
4 area of the triangle PQR = Area of the square PRYX



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In the figure $PS \perp RQ$. Show that $PQ^2 - PR^2 = SQ^2 - RS^2$.



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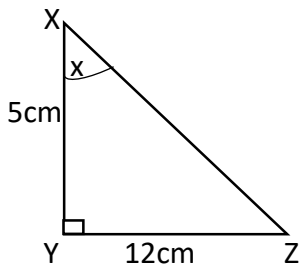
Mathematics

Third Term

Unit Test

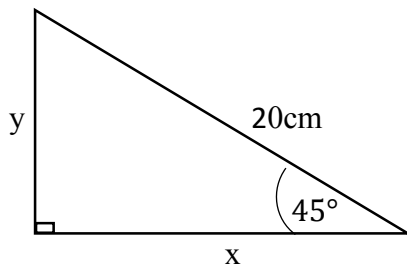
**18) Trigonometry****Part I**

1. In the triangle XYZ, $\widehat{XYZ} = 90^\circ$, $YZ = 12\text{cm}$ and $XY = 5\text{cm}$, find.



- the length of XZ.
- $\text{CoS } \hat{x}$.

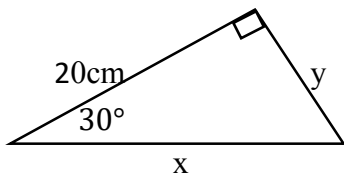
Find x and y in the figure. ($\text{Sin } 45^\circ = \frac{1}{\sqrt{2}}$, $\text{CoS } 45^\circ = \frac{1}{\sqrt{2}}$)



3. If $\text{Tan } \theta = \frac{5}{12}$, Find the value of $\text{Cos } \theta$ and $\text{Sin } \theta$.

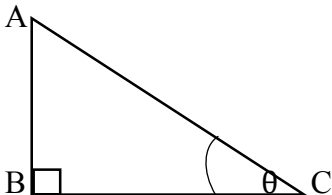
4. The angle of elevation of the top of a vertical tree 18m from its foot is 60° . Find the height of the tree ($\text{Tan } 60^\circ = 1.732$)

5. Find the value of x and y in the figure. ($\text{Sin } 30^\circ = 0.5$, $\text{CoS } 30^\circ = 0.8660$, $\text{Tan } 30^\circ = 0.5774$)



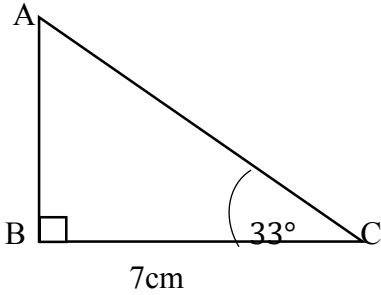
6. If $\text{Sin } \theta = \frac{8}{17}$, Find the value of $\text{Tan } \theta$.

7. If $\text{Tan } \theta = \frac{12}{5}$ in the figure, Find the value of $\text{Cos } \theta$.





8. A wire attached to a ring at the top of a lamp post is attached to a point on the ground distance 40m its foot. The angle between the wire and the ground is 45° . Find the length of the wire. ($\cos 45^\circ = 0.7071$)
9. In the triangle ABC, $\hat{A}CB = 33^\circ$, $BC = 7\text{cm}$. Find the length of AB. ($\tan 33^\circ = 0.6494$).

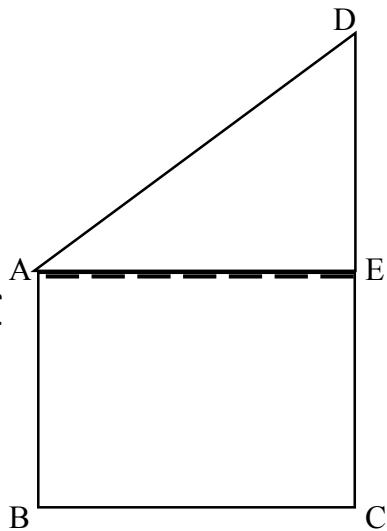


10. If $\cos \theta = \frac{9}{15}$, Find the value of $\tan \theta$.

Part II

1. The given sketch shows building CD and 4.2m height tree AB are situated on a horizontal ground at distance 50m. Angle of depression from D to A is 42° .

- i. Copy the given figure and include the above data in it.
- ii. Calculate the height of the building by using the trigonometric ratios.

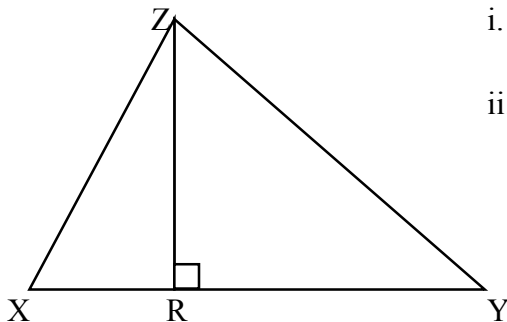


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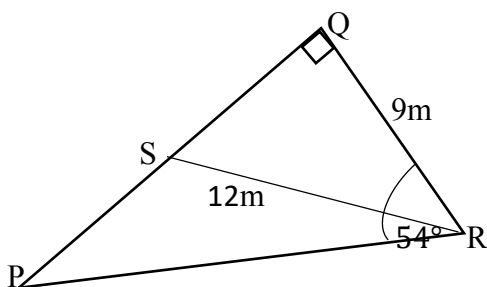
2. XY is a section of a straight road lying from west to east. RZ denotes a vertical tower which lies between X and Y. The angle of elevation of Z from X is 42° . $XR=50\text{m}$.



- i. Find the height of RZ to the nearest meter using trigonometric ratios.
- ii. If $YZ=150\text{m}$, find the angle of elevation of Z when observed from Y.

3. Q is one corner of a rectangular play ground. The point R is located along one boundary of the ground 9m from Q.

- i. The point P is located along another boundary of the ground such that $\hat{Q}RP = 54^\circ$. Find the distance PQ to the nearest meter.
- ii. The point S is located on PQ, 12m away from R. Calculate the magnitude of $\hat{Q}RS$.



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**19) Matrices****Part I**

1. If $A = \begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 4 \\ -3 & 1 \end{bmatrix}$, find $A+B$.

2. Simplify.

$$\begin{bmatrix} 3 & 4 \\ 2 & -1 \\ 0 & 5 \end{bmatrix} - \begin{bmatrix} -2 & 3 \\ 5 & 7 \\ -3 & -2 \end{bmatrix}$$

3. If $\begin{bmatrix} 4 & -1 \\ 3 & 5 \end{bmatrix} - A = \begin{bmatrix} 4 & -3 \\ 9 & 2 \end{bmatrix}$, Find the matrix A.

4. If $A = \begin{bmatrix} 2 & 3 \\ 1 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & -2 \\ 3 & 1 \end{bmatrix}$, Find $2A+3B$.

5. If $P = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $Q = \begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix}$, Find PQ .

6. $P = \begin{bmatrix} 4 & -1 \\ 3 & 2 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ find the matrix Q such that $2P+Q=I$.

7. If $X = \begin{bmatrix} 4 & 3 \\ -1 & -2 \end{bmatrix}$ and $Y = \begin{bmatrix} 5 & -3 \\ 2 & -4 \end{bmatrix}$, find the $2X+Y$.

8. If $A = \begin{bmatrix} 4 & 3 \\ -2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 4 \\ -1 & 3 \end{bmatrix}$, find AB .

9. Simplify. $\begin{bmatrix} 3 & -1 \\ 4 & 7 \\ 2 & -1 \end{bmatrix} - \begin{bmatrix} 4 & -5 \\ 3 & 0 \\ -2 & 6 \end{bmatrix}$

10. If $3X+2\begin{bmatrix} 7 \\ -3 \end{bmatrix} = \begin{bmatrix} 5 \\ -3 \end{bmatrix}$ Find X.

Part II

1. i) If $X = \begin{bmatrix} 3 & a \\ 2b & 2 \end{bmatrix}$, write the matrix $3X$.

ii) Find a and b such that $3X + \begin{bmatrix} 3 & 1 \\ 8 & a \end{bmatrix} = \begin{bmatrix} 12 & 4 \\ 14 & 7 \end{bmatrix}$.

iii) Find the matrix $\begin{bmatrix} -8 & 3 \\ 7 & 4 \end{bmatrix} - 2X$.



2. If $A = \begin{bmatrix} 4 & -2 \end{bmatrix}$, $B = \begin{bmatrix} 3 \\ -1 \end{bmatrix}$, $C = \begin{bmatrix} 1 & 3 \\ -1 & 2 \end{bmatrix}$ and $D = \begin{bmatrix} -4 & 2 \\ 5 & -1 \end{bmatrix}$. Find,

- i) $2C+D$
- ii) AB
- iii) CB
- iv) CD

3. i) Write the matrix P, if $P + Q = \begin{bmatrix} 4 & 3 & -1 \\ 5 & 2 & 1 \end{bmatrix}$ and $Q = \begin{bmatrix} -2 & 3 & 4 \\ -1 & 5 & 2 \end{bmatrix}$

ii) If $X = \begin{bmatrix} 4 & -3 \\ 1 & 2 \end{bmatrix}$ and $Y = \begin{bmatrix} -2 & -3 \\ 5 & -2 \end{bmatrix}$, Find,

- a) $X + 2Y$
- b) XY

iii) If $A = \begin{bmatrix} 4 & 1 \\ -2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} -3 & 5 \\ 4 & -1 \end{bmatrix}$ Find the matrix C, such that $A - B - C = 0$



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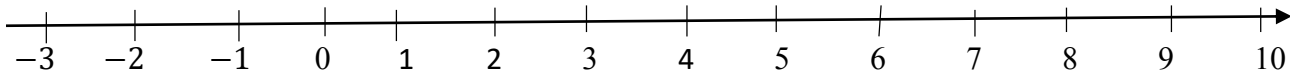
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Unit Test



20) Inequalities

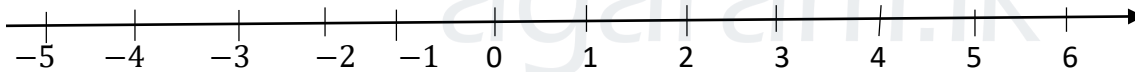
1. Represent the solutions of the inequality $2x - 1 \geq 1$ on a number line.
2. If x is a positive integer, write two values of x which satisfy the inequality $x+3 < 7$.
3. Write the integral values of x which satisfy both the inequalities $x > 3$ and $x \leq 5$.
4. Mark the interval of solutions which satisfy the inequalities $x \geq -1$ and $x < 4$.



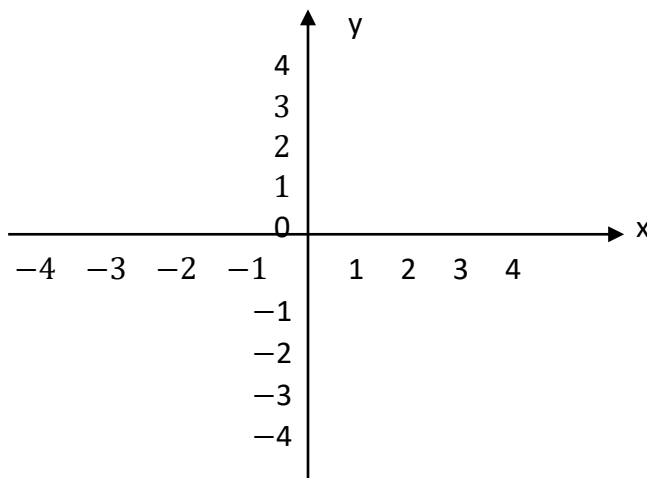
5. Solve the inequality $5x - 1 \leq 4$ and represent the set of integral solutions on a number line.
6. Solve the inequality $4x - 3 \leq 3x - 1$ and write the largest integral value that x can be taken.
7. Solve the given inequality and mark the solutions on a number line. $5 - 3x > -7$.
8. Write the largest positive integer which satisfy the inequality $4x - 3 \leq 17$.
9. Write the inequality denoted on the number line.



10. Write down the negative integral solutions of the inequality $3x - 2 > -14$
11. Represent the inequality $-3 \leq x < 1$ on the number line given below.



12. Write the set of integral solutions of $-4x \geq 8$.
13. Solve the inequality $5x - 1 < 4$ and write down the largest integer that x can take.
14. Write down the coordinates of 2 points that belong to the region $y > x$.
15. Write down the coordinates of 3 points which satisfy both the inequalities $y < -3$ and $y > x$.
16. Which of the following points belong to both regions $x \leq -1$ and $y > 0$.
(5,3), (-2,1), (-1,-2)
17. Shade the region $y \geq -2$.





18. Sunil has Rs.300. He bought 4 apples at the rate of Rs. x each and 3 oranges at the rate of Rs.40 each. Build up an inequality for this information and find out the maximum price of an apple.

19. Find the minimum whole number value of x that satisfies the inequality $5x - 3 > 3x + 1$.

20. Amal bought 6 Rambutans at Rs. x and 6 toffees at Rs.3 each. Sunil bought 3 Rambutans at Rs. x each and 6 toffees at Rs.4 each. If the amount spent by Amal is more than or equal the amount Sunil spent, what is the minimum price of a Rambutan?



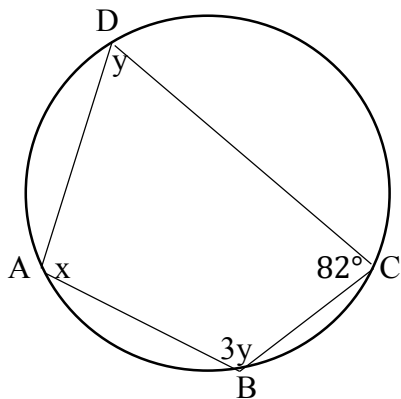
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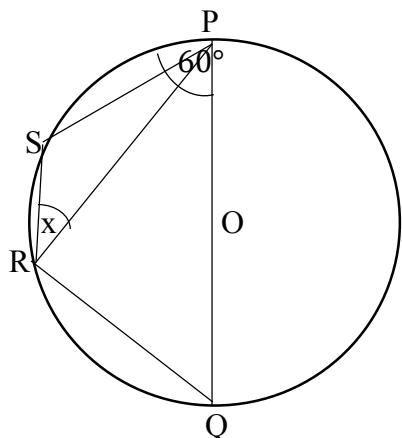
21) Cyclic Quadrilaterals

Part I

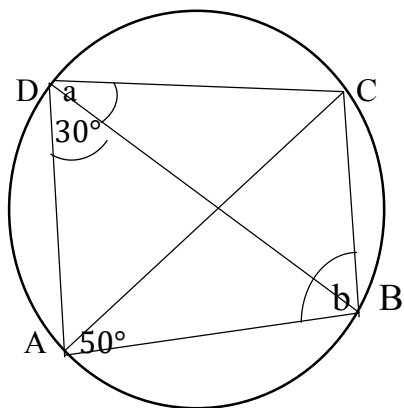
1. ABCD is a cyclic quadrilateral. Find the values of x and y .



- In the diagram, the vertices of the quadrilateral PQRS lie on a circle with centre O. Find the value of x .



3. ABCD is a cyclic quadrilateral. Find the values of a and b .



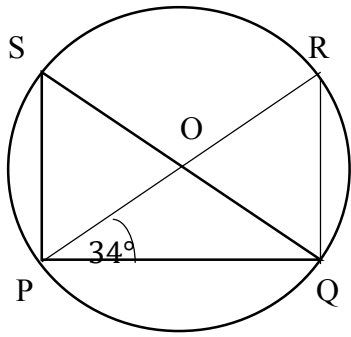
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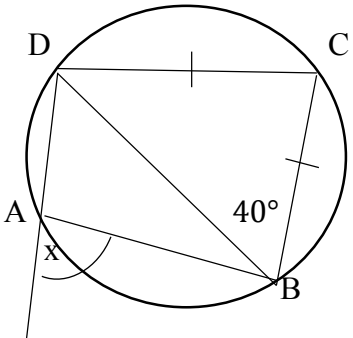
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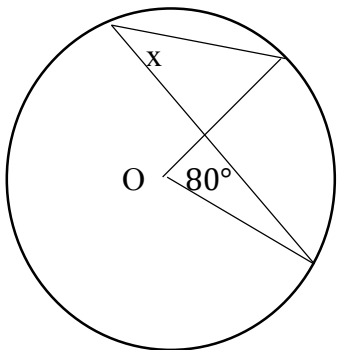
4. In the circle with centre O shown in the figure, $\widehat{RPQ} = 34^\circ$ Find the magnitude of \widehat{PSQ} .



5. In the figure ABCD is a cyclic quadrilateral. Find the value of x.

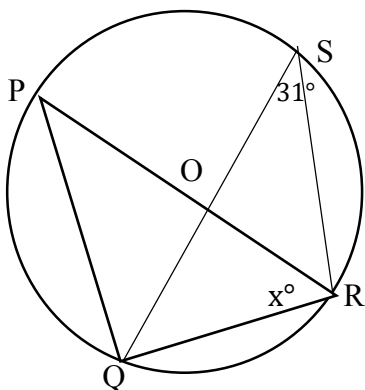


The centre of the given circle is O. Find the value of x.



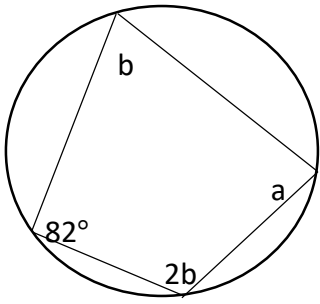
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7. O is the centre of the circle in the figure. Find the value of x.

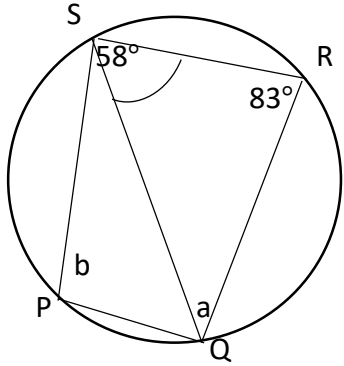




8. Find the angles marked by symbols.

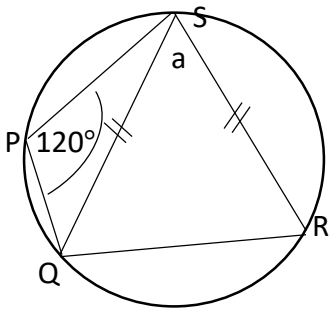


9. PQRS is a cyclic quadrilateral. Find the value of a and b.



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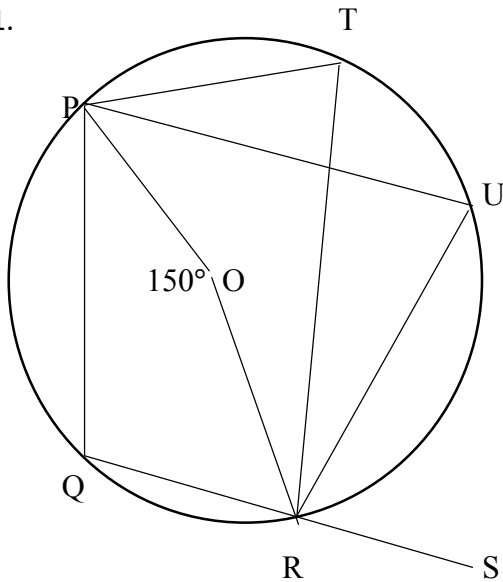
10. PQRS is a cyclic quadrilateral. Find the value of a.



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Part II

1.



According to the data in the figure,

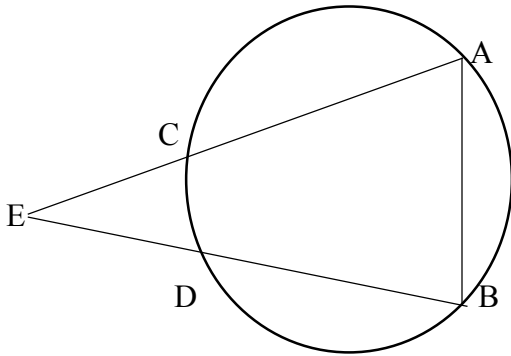
- i. Find the value of \widehat{PTR} .
- ii. Find the value of \widehat{PQR} .
- iii. Name an angle equal to angle \widehat{PUR} .
- iv. Name an angle equal to angle \widehat{URS} .
- v. By giving reasons name an angle equal to angle \widehat{TRS} .

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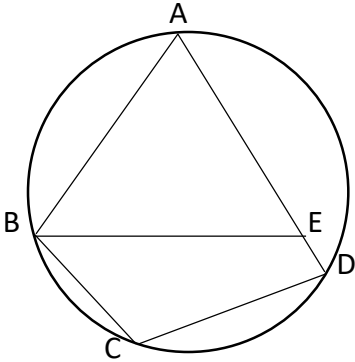


2. In the cyclic quadrilateral ABDC, AC and BD produced meet at E. If $AE=BE$,

- i. Show that CDE is an isosceles triangle.
- ii. Prove that $AB \parallel CD$.



3. In the cyclic quadrilateral ABDC. $AB=BE$. Show that $\hat{BED} = \hat{BCD}$

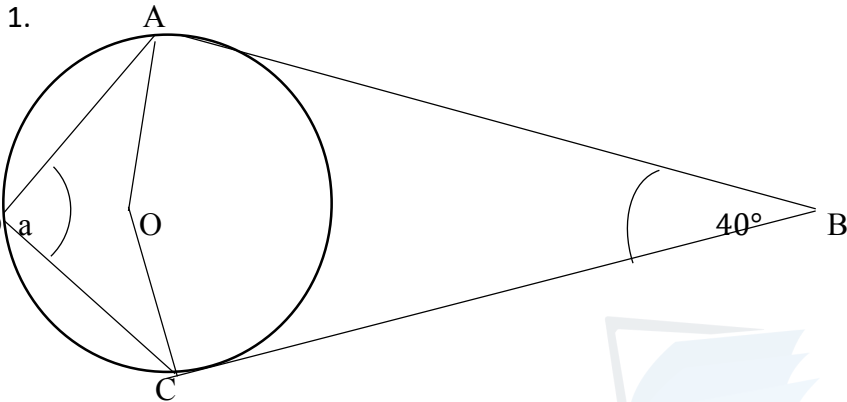


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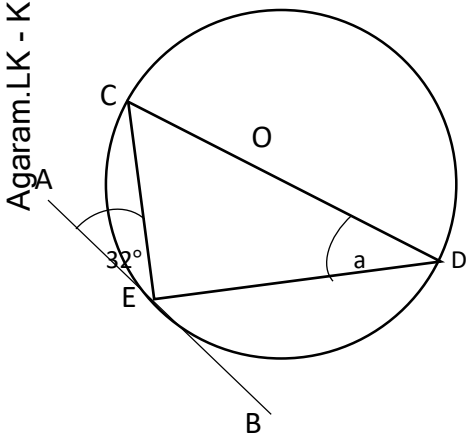
22) Tangents

Part I

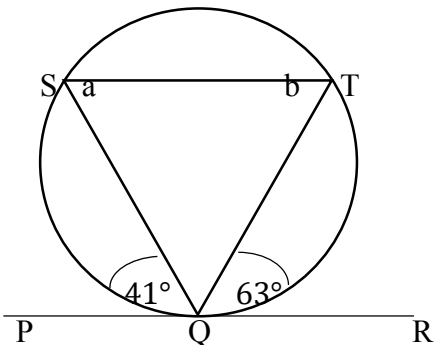


In the figure, AB and CB are tangents to the circle with centre O. Find the value of a

2. The tangent AB drawn to the circle of which CD is a diameter, touches the circle at E. Find the value of a.



3. In the figure PR is a tangent at Q. Find the values of a and b.



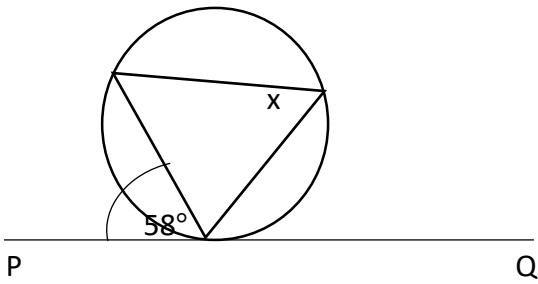
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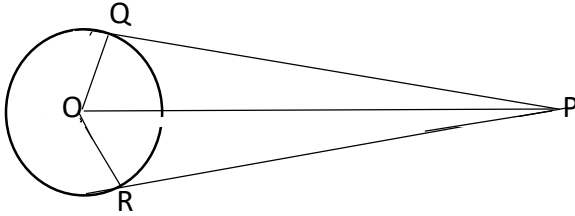
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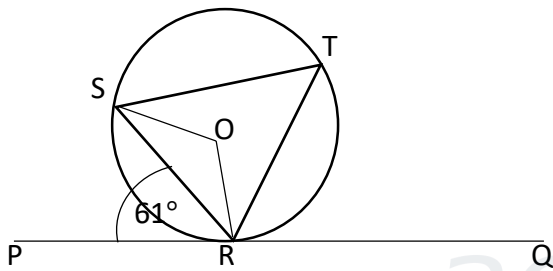
4. PQ is a tangent to the circle. Find the value of x.



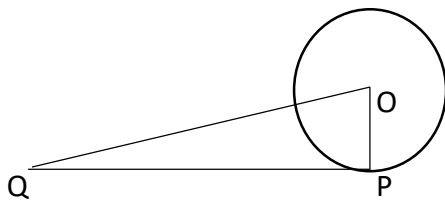
5. PQ and PR are two tangents drawn to the circle with centre O, from external point P. If $\angle QPO = 24^\circ$, Find the magnitude of $\angle QOR$.



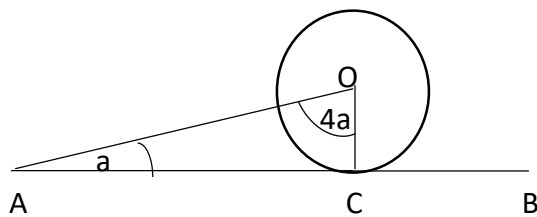
6. In the figure, PQ is a tangent to the circle with centre O. Find the magnitude of $\angle SOR$.



7. In the figure, QP is a tangent to the circle with centre O. If the radius of the circle is 5cm and $OQ = 13$ cm find the length of QP.

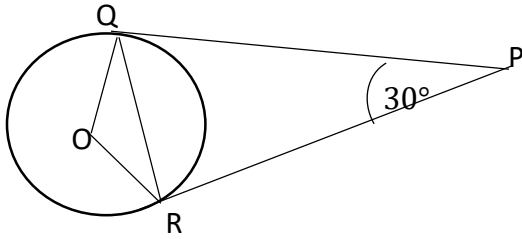


8. In the figure, AB is a tangent to the circle with centre O. Find the magnitude of $\angle AOC$.

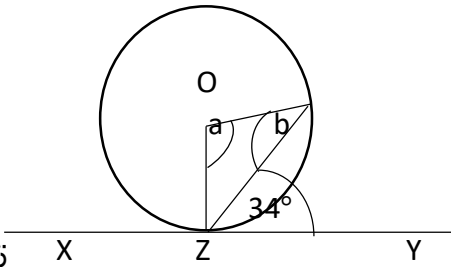




9. In the figure PQ and PR are tangent to the circle with centre O. Find the magnitude of $\widehat{P\hat{R}Q}$.



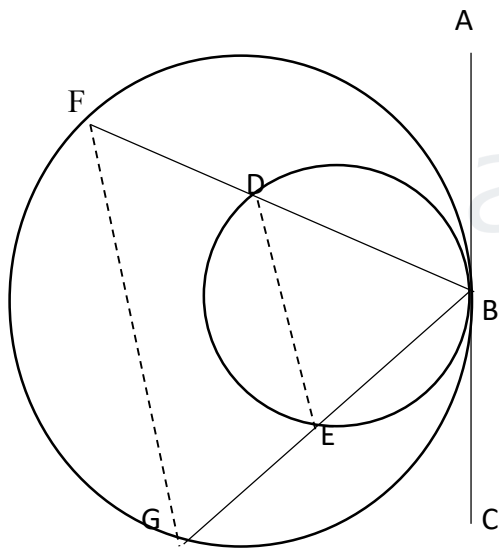
10. In the figure XY is a tangent at Z. O is the centre of the circle. Find the values of a and b.



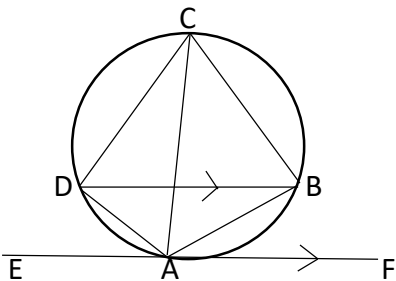
PART II

1) The tangents at the point B to two circles which touch each other internally at B is ABC. The two chords BF and BG of the large circle, drawn from the point B, intersect the smaller circle at the points D and E respectively.

- i. Show that $DE \parallel FG$.
- ii. If $BF = BG$, Show that DFGE is a cyclic quadrilateral.



2) In the given diagram, ABCD is a cyclic quadrilateral. The tangent drawn to the circle at A is EF.



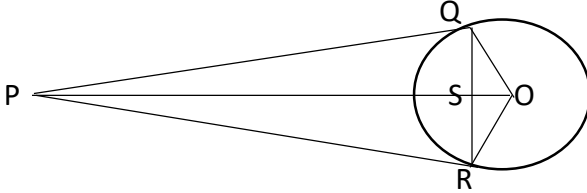
- i. Name an angle equal to \widehat{BAE} . Give reasons for your answer.
- ii. Show that $\widehat{DCA} = \widehat{BCA}$
- iii. Show that $AB = AD$.

- iv. If AC is a diameter of the circle, $AB = x$ cm and $BC = 2AB$, show that the diameter of the circle is $\sqrt{5} x$ cm.



- 3) In the figure PQ and PR are tangents to the circle with centre O.

- Show that,
- $\widehat{PQS} = \widehat{PRS}$
 - $QS = SR$
 - PQOR is a cyclic quadrilateral.



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Grade 11

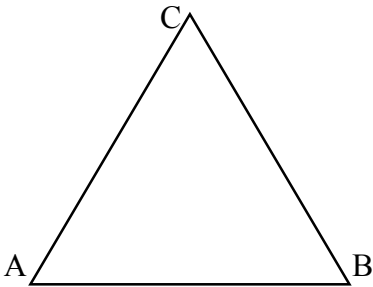
Mathematics

Third Term

Unit Test

**23) Constructions****Part I**

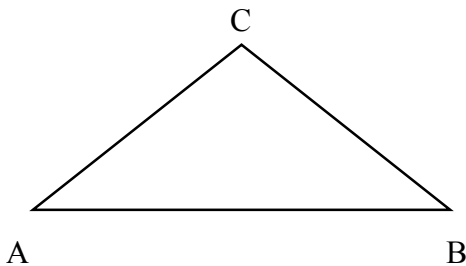
1. The location of a point X which lies on AB, and equidistant to AC and BC is needed to be marked, By showing the relevant construction lines mark the location of X.



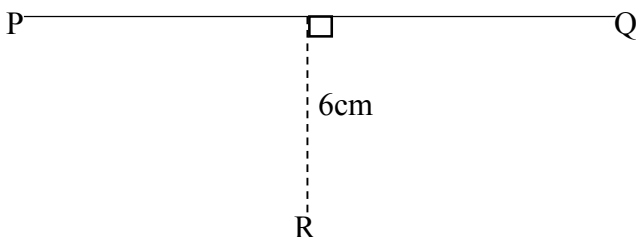
A and B are two fixed points. The point C moves such that the area of the triangle ABC is constant. Express the locus of point C with a diagram.

A sphere of radius 6cm rolled along a straight plane surface. Express the locus of the centre of the sphere with a diagram.

4. In the triangle ABC shown in the figure, draw a sketch of the construction lines required to locate the point D on AB such that $DB=DC$.

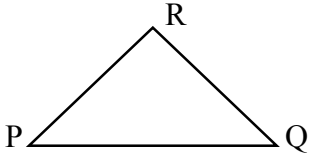


5. Draw a clear sketch of the construction lines required to find the vertices S and T which are on PQ and 8cm apart from R. Mark the points S and T on the diagram.



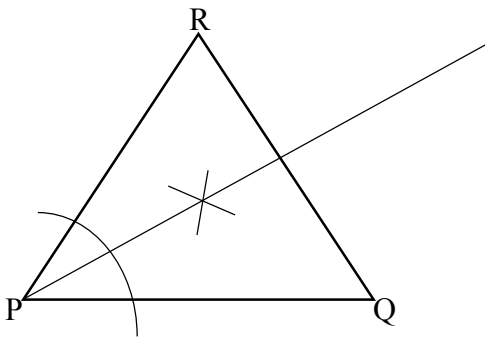


6. In the given diagram draw a sketch of relevant construction lines to locate a point S, which is equidistant to the lines PQ and PR and 6m away from P.



7. Two mango trees X and Y are situated 15m away from each other. A rambutan tree "Z" is needed to be plant equidistant to X and Y and 10m away from X. Using the knowledge of loci draw a rough sketch and show that there exist two points for Z.

8. It is needed to find the point X, which is equidistant to the three sides of the triangle PQR. An incomplete sketch drawn for that is given below. Complete the figure and mark the location of X.



Sketch a construction to find the centre of the given arc.

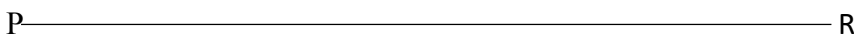


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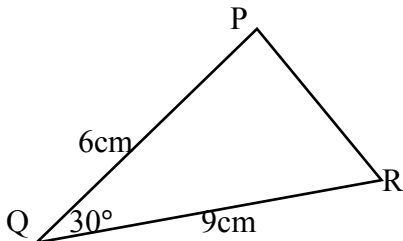
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9. The diagonal PR of a rhombus PQRS is given in the diagram. If PR=6cm and SR=8cm, by showing the relevant construction lines obtain the locations of the vertices S and Q of the rhombus.



Part II

1. Use only a straight edge with a cm/mm scale and a pair of compasses to the following constructions. Draw your construction lines clearly.

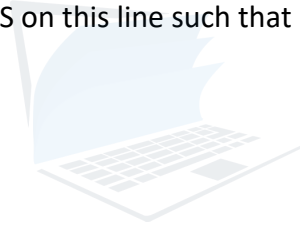


- i. Construct the given triangle PQR.
- ii. Construct a perpendicular from P to QR and name the point it meets QR as S.
- iii. Construct the circle that passes through the points P, R and S.

- iv. Construct the tangent to this circle at the point R, and name the point at which it meets PS produced as T.



2. Using only a straight edge with a mm/cm scale and a pair of compasses, and indicating the lines of construction clearly.
- Construct $P\hat{Q}R$ such that $PQ=8\text{cm}$, $P\hat{Q}R = 30^\circ$ and $QR = 6\text{cm}$.
 - Obtain the location of S which lies at equal distance from Q and R and is such that $P\hat{Q}S = 90^\circ$.
 - Construct the circle that has S as its centre and SQ as its radius.
 - Produce QS and name the point of intersection of that line and circle as T.
 - By giving reasons find the value of $Q\hat{T}R$.
3. Using only a straight edge with a cm/mm scale and a pair of compasses, and showing the construction lines clearly;
- Construct a straight line segment PQ of length 9cm.
 - Construct the perpendicular bisector of PQ.
 - Obtain the location of R such that $PR=7\text{cm}$ and $P\hat{R}Q = 90^\circ$.
 - Measure and write down the length of QR.
 - Construct a straight line parallel to PQ through R.
 - Find the location of point S on this line such that $R\hat{P}Q = R\hat{S}Q$.
 - Giving reasons, find $P\hat{S}Q$.



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NALANDA COLLEGE - COLOMBO 10

Grade 11

Mathematics

Third Term

Unit Test



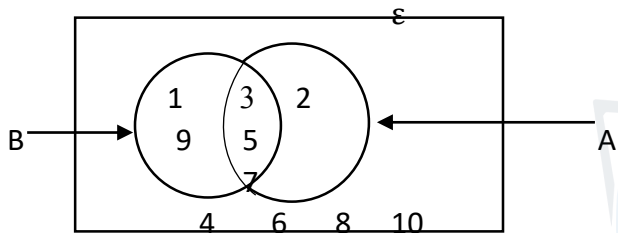
24) Sets

Part I

1. If $n(A) = 40$, $n(B) = 60$ and $n(A \cap B) = 42$, Find $n(A \cup B)$.

2. If $\epsilon = \{1,2,3,4,5,6,7,8,9,10\}$ and $X = \{2,4,6,8,10\}$ Find X' .

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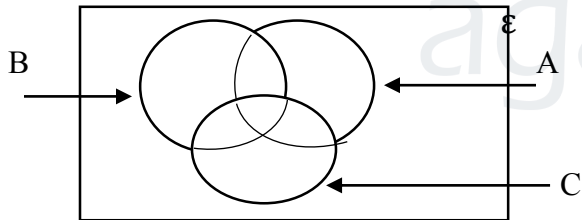


Find $(A \cap B)'$.

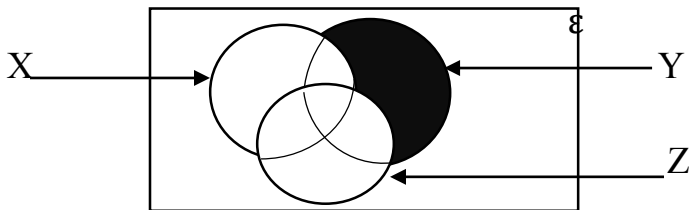


4. If $\epsilon = \{a, b, c, d, e\}$ and $X = \{b, c, d\}$. Denote in a Venn diagram and write the set X' .

5. Shade the region $(A \cap B)' \cap C$ in the given Venn diagram.



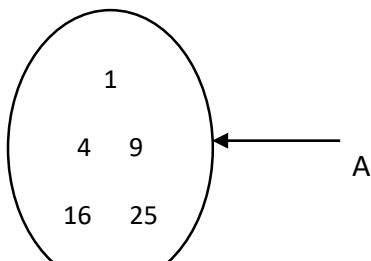
6. Write down the shaded region in the Venn diagram using set notation.



7. If $\epsilon = \{1,3,5,7,9\}$ and $A = \{5\}$. Denote it on a Venn diagram and write the set A' .

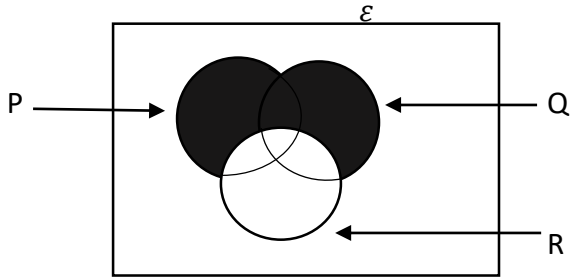
8. If $\epsilon = \{a, b, c, d, e, f\}$, $A = \{a,b,c\}$ and $B = \{b,c,d\}$ find $A \cap B$.

9. Express the set A using the set builder method.



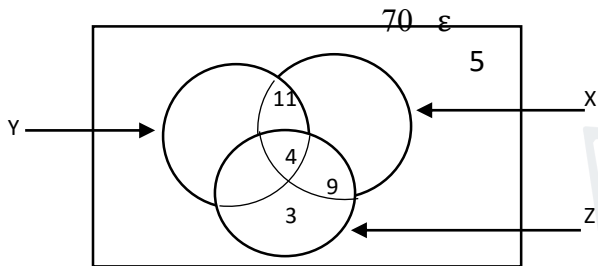


10. Write the set notation, the region shaded in the Venn diagram.



Part II

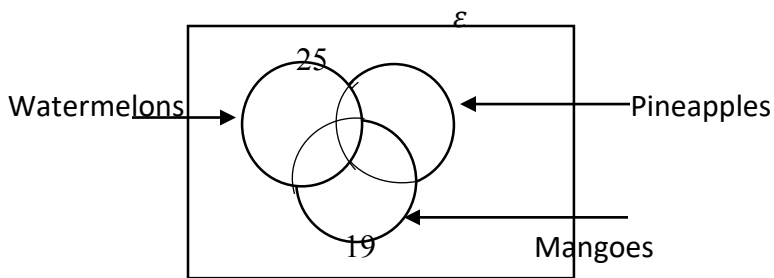
1. These sets X, Y and Z belonging to the universal set ϵ are shown in the Venn diagram $n(X) = 34, n(Y) = 32$ and $n(\epsilon) = 70$.



- i. Copy the Venn diagram into your answer script and shade the region $(X \cap Y)' \cap Z'$.
- ii. How many elements belong to set X only?
- iii. Find $n(X \cup Y \cup Z)$.
- iv. Find $n[(X \cup Y)']$.
- v. Find $n[(X \cup Y)' \cap Z]$.

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 2) An incomplete Venn diagram containing the information about customers who came to particular fruit stall to buy water melons, pineapples and mangoes is shown in the figure.



The number of people who bought water melons and mango is 7, two of them did not buy pineapples. The number of people who bought only pineapples is 8 while 12 bought pineapples and mangoes. 5 bought only water melons. Everyone who comes to the fruit stall buys at least one fruit.

- i. Represent this information in the given Venn diagram.
- ii. How many bought only water melons and pineapples?
- iii. How many bought only mangoes?
- iv. Find the total number of customers who came to the fruit stall.



3) $\varepsilon = \{a, b, c, d, e, f, g, h, i, j, k, l, m\}$

$A = \{e, f, g, h, i, j\}$

$B = \{g, h, i, j\}$

$C = \{e, k, l\}$

- i. Represent the given sets in a Venn diagram.
- ii. Find,
 - a) $(A \cap B)$
 - b) $(A \cup B) \cap C$
 - c) $(A \cup B \cup C)'$
- iii. Shade the region $(A \cap B)' \cap C$ in the Venn diagram.



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NALANDA COLLEGE - COLOMBO 10

Grade 11

Mathematics

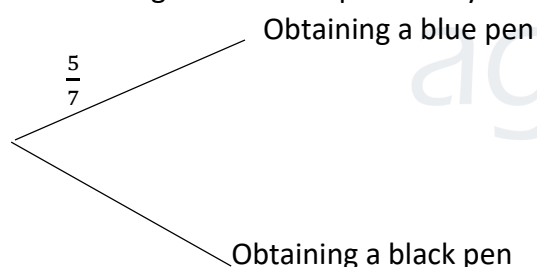
Third Term

Unit Test

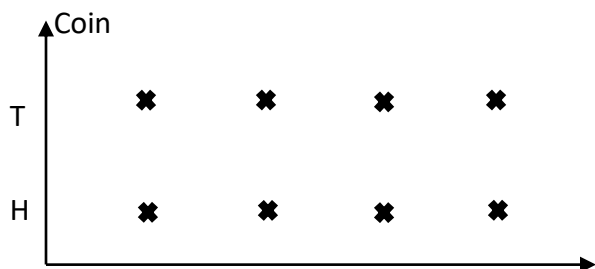
25) Probability

Part I

1. A cubical die with its faces marked 1,2,3,4,5 and 6 is rolled twice. By considering the numbers on the faces that touch the table, represent all the possible outcomes on a grid.
2. There are 4 identical blue beads and 3 red beads in a bag. Find the probability of randomly selected bead being,
 - i. A white bead,
 - ii. A red bead.
3. Find the probability of obtaining a number greater than 2, when rolling a tetrahedral die marked 1 to 4 on its faces.
4. A tree diagram related to the selection of a pen, taken out randomly from a bag containing blue and black pens is given in the figure. Find the probability of obtaining a black pen.

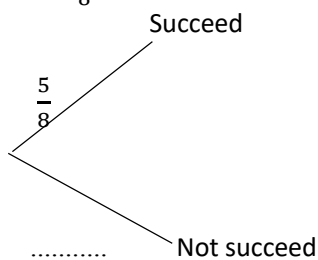


5. Find the probability of obtaining a composite number, when rolling an unbiased die marked 1 to 6 on its faces.
6. If the probability of occurring an event X is $\frac{3}{5}$, what is the probability of not occurring the event X is?
7. When two, five-rupee coins are tossed simultaneously, find the probability that at least one coin shows tail.
8. For the events X and Y of a random experiment. $P(X) = \frac{3}{7}$, $P(Y) = \frac{2}{7}$ and $P(X \cap Y) = \frac{1}{14}$. Find $P(X \cup Y)$.
9. There are 8 identical cards numbered from 1 to 8 in a box. A card is taken from the box randomly. Find the probability of getting a prime number.
10. If an unbiased coin and a tetrahedral die are tossed, possible outcomes are denoted on the given grid. Find the probability of an even number on the die and tails on the coin.



PART II

- 1) In a competition of shooting at a target, the probability of shooting at a target for a particular competitor is $\frac{5}{8}$.



- i. Complete the given incomplete tree diagram.
- ii. If he shoots twice at the target, extend the given tree diagram in a suitable way.
- iii. Find the probability of the following events.
 - a) He succeeds in both attempts
 - b) He succeeds only in one attempt
 - c) He does not succeed in any of the two attempts.

- 2) There are 9 mangoes of the same size in a bag. 5 of them are raw and rest are ripe. One mango is drawn from the bag and observed whether it is raw or ripe, and without replacing the first one, another mango is drawn and observed.

- i. Denote the sample space of the above experiment on a grid.
- ii. Find the probability that the first mango drawn is ripe.
- iii. Find the probability that the second mango drawn is raw.
- iv. Find the probability that both mangoes are raw.

- 3) The boxes P and Q contain identical balls. Box P has 3 blue balls and 4 white balls. The box Q has 2 blue balls and 3 white balls. A ball is taken out at random from bag P and put into bag Q and then a ball is taken out at random from bag Q.

- i. Represent the sample space relevant to this experiment in a tree diagram.
- ii. Find the probabilities of the following events.
 - a) The ball taken from Q is a blue ball
 - b) The ball taken from P is a white ball