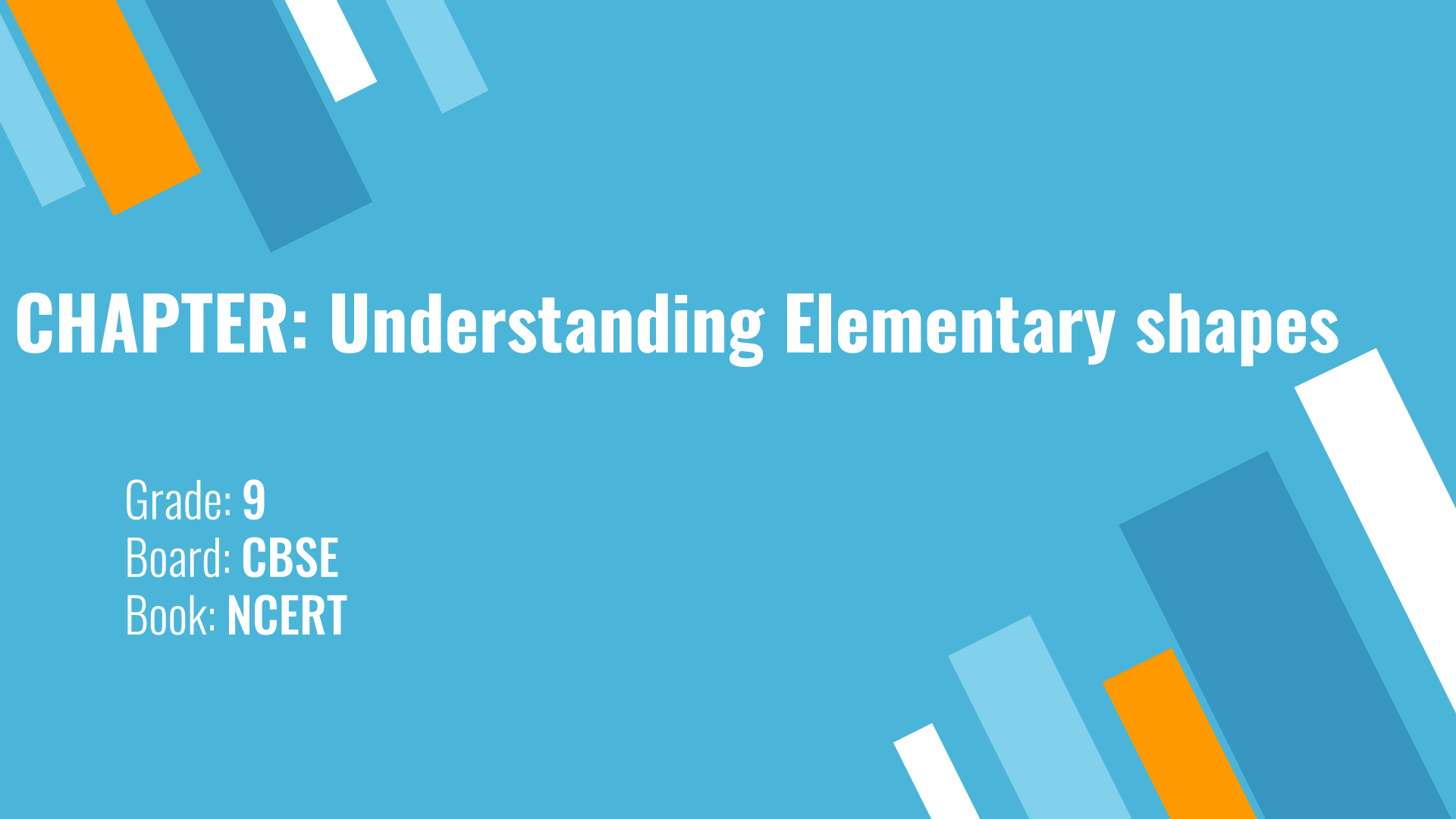




CHAPTER: Understanding Elementary shapes

Grade: 9

Board: **CBSE**

Book: **NCERT**



1.

Chapter Summary and Placement

<Read through the following to understand how this chapter is connected with the previous and next grades and also the important concepts covered in it.>



- 
- 
1. This chapter connects to chapter basic geometrical ideas of the same grade and extends to knowledge of solid shapes and its elements, classification of angles and triangles
 2. This chapter's knowledge plays a significant role in surface areas and volumes and also chapters involving triangles; lines and angles in future grades



2.

LEARNING OUTCOMES

<On completion of the chapter, students will be able to:>



- 
- 
1. Compare the length of line segments by measuring them
 2. State the types of angles
 3. Measures the angles
 4. Define perpendicular lines
 5. Identify direction by analysing revolutions
 6. Classify triangles basing on sides and angles
 7. Recall types of quadrilaterals and list out their properties
 8. List out polygons
 9. Acquire the knowledge of Solid shapes, Elements of solid shapes[Face, edge and vertex]; finding out elements of different solid shapes
 10. Apply the concept of angles to *[Higher order of thinking][Refer to worksheet 5 for explanation and problems]*
 - i) Find out angle between the hands of a clock
 - ii) Find out unknown angle



3. TEACHING PLAN

Follow this section for getting ideas on teaching the content covered in the chapter. The subtopic given in the first column with the matching learning outcome can be explained using instructions and resources listed subsequently



Subtopic and Learning Objective #1

Subtopic: Comparison of line segments

LO:

Compare the length of line segments by measuring them

1.To make the students understand methods of comparis

Teacher Activity

1. Introduce Comparison by observation, comparison by tracing, comparison with ruler and divider.
2. Explain the measures of markings on the ruler[centimeters side and inches side]
3. Make students measure the length of a given line segment

Check for understanding:

- a) Which method is near to perfect in comparison of two line segments or measuring a line segment
- b) Measure[both in inches and cm] the given line segment with ruler and divider[line segment can be of teachers choice]

Resources Suggested

Blackboard, pen, paper, ruler and divider from teachers instrument box

Subtopic and Learning Objective #2

Sub topic:Types of angles and measure of angles

LO:

State the types of angles

1. To make students understand types of angles

LO:

Measures the angles

- 1.To make the students measure the given angle

LO :

Define perpendicular lines

- 1.To make students understand the meaning of perpendicularity

Teacher Activity

1. Introduce types of angles: Zero, acute, right, obtuse, reflex, complete angles. Can discuss angles between the hands of a clock to explain the types in an effective way.
2. Introduce the method of measuring the angles
3. Introduce perpendicular lines by showing examples like corners of board, alphabet T and so on
4. Use **Resource 1** for greater clarity

Check for understanding:

- a) If the measure of an angle is.....then it is called.....[Measure can be of teachers choice]
- b) What type of angle is formed if time is 3?
- c) What type of angle is formed if the time is 12: 25?
- d) What type of angle is formed if the time is 6?
- e) What is the unit of measure of an angle?

Resources Suggested

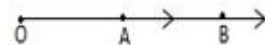
Blackboard, pen, paper, ruler and divider from teachers instrument box

Resource 1

Types of angles

Angle is measured in degrees and is represented as 30° , 90°

Zero angle : An angle whose measure is 0° is called zero angle



Acute angle : An angle whose measure is $>0^{\circ}$ and $<90^{\circ}$



Right angle : An angle whose measure is 90°



Obtuse angle : An angle whose measure $>90^{\circ}$ and $<180^{\circ}$



Resource 1

Straight angle : An angle whose measure is 180°



Reflex angle : An angle whose measure is $>180^\circ$ and $<360^\circ$



Complete angle : An angle whose measure is 360°

Subtopic and Learning Objective #3

Sub topic:Direction and revolutions

LO:

Identify direction by analysing revolutions

1. To make student the directions and revolutions

Teacher Activity

1. Introduce directions: North, south, east, west. As an extension can introduce North- east, North-west, South-east and south- west.
2. Introduce clockwise and anti clockwise revolutions. Measure of angle between N to NE; NE to W and so on is 45°
3. Make a student to stand facing one direction and make him move in clockwise or anti clockwise direction to other direction and ask others to tell the measure of the angle which the student makes
4. **Resource 2 can be used for better explanation**

Check for understanding:

- a) What is the measure of angle between N to E in anticlockwise direction.

Ask some more questions changing direction and revolution

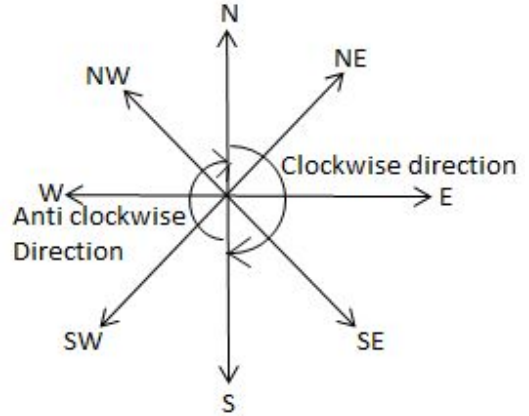
Resources Suggested

Blackboard, pen and paper. **Resource 2 can be used for better explanation**

Resource 2

Find the types of angles/ measure of angles between the following directions

- i) From N to E in clockwise direction.
- ii) From N to W in anti clockwise direction
- iii) From N to NE in clockwise direction.
- iv) From NW to SE anti clockwise direction.
- v) From SW to N in anticlockwise direction
- vi) From N to SE in clockwise direction
- vii) From W to NE in clockwise direction.
- Vii) From N to S clockwise direction
- viii) From NW to SW in anti clockwise direction



Subtopic and Learning Objective #4

Sub topic:Types of triangles

LO:

Classify triangles basing on sides and angles

1. Learn to classify triangles

Teacher Activity

1. Introduce classification of triangles basing on sides and basing on angles as given in NCERT text book including **Do the Activity** suggested in the textbook

Check for understanding:

- a) Name the type of Triangle with length of sides 7cm, 7cm, and 9cm
- b) Name the type of triangle with angles 45° , 90° and 45°
- c) Name the type of triangle whose measures are 5cm, 5cm, 5cm
- d) Name the type of the triangle whose angles are 60° , 70° and 50°

Likewise ask as many questions until the students become perfect

Resources Suggested

Blackboard, pen and paper.

Subtopic and Learning Objective #5

Sub topic: Types of quadrilaterals

LO: Recall types of quadrilaterals and list out their properties

1. To make student understand types of quadrilaterals and their properties

Teacher Activity

1. Introduce types of quadrilaterals and their properties
2. Use **Resource 3** for greater clarity

Check for understanding:

- a) Describe the properties of any quadrilateral [Type of the quadrilateral is teachers choice]
- Ask more questions until students gain perfection

Resources Suggested

Blackboard pen and paper. **Resource 3** can be used for better understanding

Resource 3

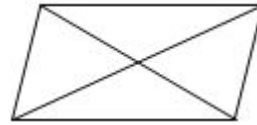
Trapezium/ Trapezoid: A quadrilateral with one pair of sides are parallel is called trapezium. In a trapezium

1. One pair of opposite sides is parallel
2. Diagonals are not equal



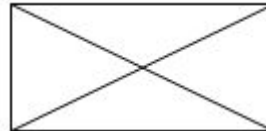
Parallelogram: A quadrilateral with two pairs of sides parallel is called a parallelogram. In a parallelogram

1. Opposite sides are parallel and equal.
2. Opposite angles are equal.
3. Adjacent angles are supplementary
4. Diagonals are not equal
5. Diagonals bisect each other



Rectangle: A parallelogram in which each angle is a right angle is called a Rectangle. In a rectangle

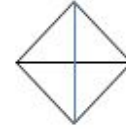
1. Opposite sides parallel and equal
2. Each angle is 90°
3. Diagonals are equal
4. Diagonals bisect each other



Resource 3

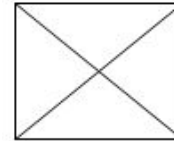
Rhombus: A parallelogram with all sides equal is called a rhombus. In a rhombus

1. All sides are equal
2. Opposite angles are equal
3. Adjacent angles are supplementary
4. Diagonals are not equal
5. Diagonals bisect each other at right angles



Square: A rhombus whose all angles are equal is called a square. In a square

1. All sides are equal
2. All angles are equal and 90°
3. Diagonals are equal
4. Diagonals bisect each other at right angles



Kite: A rhombus whose set of adjacent pairs of sides are equal. In a kite

1. Each pair of adjacent sides are equal
2. One pair of opposite angles are equal
3. Diagonals are not equal

4. Diagonals bisect each other at right angles



Subtopic and Learning Objective #6

Sub topic: Polygons

LO: List out polygons

1. To make student to identify the polygons

Teacher Activity

1. Recapitulate the definition of polygon and introduce polygons[based on number of sides] from triangle to decagon. Pls refer table showing number of sides, name of the polygon, illustration in NCERT text book

Check for understanding:

- a) Name the polygon with seven sides
- b) Number of sides of octagon

Ask some more questions until they get familiar

Resources Suggested

Black board, pen and paper

Subtopic and Learning Objective #7

Sub topic: Solid shapes

LO: Acquire the knowledge of Solid shapes, Elements of solid shapes[Face, edge and vertices]; finding out elements of different solid shapes

1. To make students understand solid shapes and their elements

Teacher Activity

1. Introduce solid shapes and their elements[faces, edges and vertices].
2. **Activity can be performed to check overall understanding of whole chapter**
3. **Resource 4** can be used for practice

Check for understanding:

- a) Which solid shape is made up of only squares as its faces?
- b) Number of edges of triangular pyramid?
- c) Number of vertices of cuboid?

Ask more questions until students gain perfection

Resources Suggested

Blakboard, pen and paper. **Resource 4** can used as practice

Activity 1

Activity

Name of the activity-Flash card Game

Type of activity – Group

Use it for – Recap of whole chapter at the end

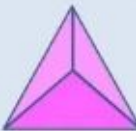
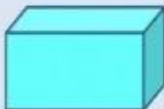
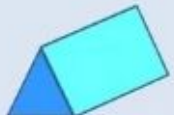
Materials – Flash cards with the pictures of solid figures, types of angles, types of Quadrilaterals, types of triangles

Procedure –

Instructions to the teachers:

1. Divide the class into small groups and name them with the names in the chapters like solid shapes, quadrilaterals, types of angles, types of triangles, directions [don't name as rectangle or cone of acute angle as they may create confusion while answering]
2. Now pick out a flash card and ask them to tell at least three points about the picture
3. The students will be able to revise the entire chapter this way

Resource 4

Cone  2 Faces 1 Edge 1 Vertex	Sphere  1 Face 1 Edge 0 Vertices	Tetrahedron  4 Faces 6 Edges 4 Vertices	Cuboid  6 Faces 12 Edges 8 Vertices
Cylinder  3 Faces 2 Edges 0 Vertices	Cube  6 Faces 12 Edges 8 Vertices	Triangular Prism  5 Faces 9 Edges 6 Vertices	Square-based pyramid  5 Faces 8 Edges 5 Vertices

S. No.	Solid	Shape of Solid	Number of faces (F)	Number of Vertices (V)	Number of edges (E)
a.	Cuboid		6	8	12
b.	Triangular Pyramid		4	4	6
c.	Square Pyramid		5	5	8
d.	Rectangular Pyramid		5	5	8
e.	Pentagonal Pyramid		6	6	10
f.	Hexagonal Pyramid		7	7	12
g.	Triangular Prism		5	6	9



5. WORKSHEETS

Print or copy the worksheet questions on the blackboard and ask the students to attempt them. They can be given as homework or a class test as well.

Worksheet 1

Answer the following:

1. Identify the types of following angles and also measure them using protractor

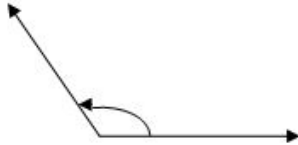
i)



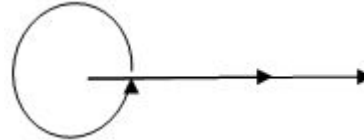
iv)



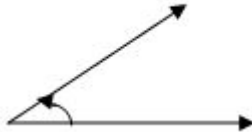
ii)



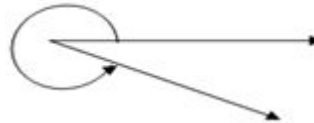
v)



iii)



vi)



Worksheet 1

What is the measure of angle between the directions in clockwise direction draw figure?

i) From N to E.

ii) From NW to SW.

iii) From N to NE.

iv) From NW to SE.

Worksheet 2

Use it like: test after the chapter is complete, homework

Answer the following:

1. Classify the types of triangles whose measures are given below :

i) 6cm , 8cm , 10cm.

ii) 5.8 cm , 7cm , 5.8 cm.

iii) a cm, a cm , a cm.

iv) 58° , 83° , 39°

v) 46° , 90° , 44° .

vi) 109° , 40° , 31° .

Worksheet 2

Write the properties of the following quadrilaterals with figures:

i) Rhombus

ii) Rectangle

iii) Square

iv) Trapezium

v) Parallelogram

Worksheet 3

S.no	Illustration of polygon	Name of the polygon
1.		
2.		
3.		
4.		
5.		

Use it like: test after the chapter is complete, homework

Fill the following table

Worksheet 4

Fill the following table :

1) cylinder  Faces: _____ Edges: _____ Vertices: _____	5) cone  Faces: _____ Edges: _____ Vertices: _____
2) sphere  Faces: _____ Edges: _____ Vertices: _____	6) cube  Faces: _____ Edges: _____ Vertices: _____
3) rectangular prism or cuboid  Faces: _____ Edges: _____ Vertices: _____	7) square pyramid  Faces: _____ Edges: _____ Vertices: _____
4) triangular prism  Faces: _____ Edges: _____ Vertices: _____	8) triangular pyramid  Faces: _____ Edges: _____ Vertices: _____



6. SOLUTIONS

This section gives you sample answers for activities and questions listed above.



Worksheet 1

.Types of angles[Measuring of these angles can be assessed by the teacher]

- i) Zero angle
- ii) Obtuse angle
- iii) Acute angle
- iv) Straight angle
- v) complete angle
- vi) Reflex angle

2. Measure of angles basing on directions

- i) 90°
- ii) 270°
- iii) 45°
- iv) 180°

Worksheet 2

Types of triangles

- i) Scalene triangle
- ii) Isosceles triangle
- iii) Equilateral triangle
- iv) Acute angled triangle
- v) Right angled triangle
- vi) Obtuse angled triangle

2. Properties of quadrilaterals [Can check the figures drawn by student]

Rhombus

- 1. All sides are equal
- 2. Opposite angles are equal
- 3. Diagonals are not equal
- 4. Diagonals bisect each other at right angles

Rectangle

- 1. Opposite sides parallel and equal
 - 2. Each angle is 90°
 - 3. Diagonals are equal
 - 4. Diagonals bisect each other
- Square
- 1. All sides are equal
 - 2. All angles are equal and 90°
 - 3. Diagonals are equal
 - 4. Diagonals bisect each other at right angles

Worksheet 2

Square

1. All sides are equal
2. All angles are equal and 90°
3. Diagonals are equal
4. Diagonals bisect each other at right angles

Trapezium

1. One pair of opposite sides is parallel
2. Diagonals are not equal

Worksheet 3

1. Pentagon
2. Heptagon/septagon
3. Decagon
4. Octagon
5. Hexagon

Worksheet 4

1. Cylinder: Faces- 3 , Edges- 2 , Vertices- 0
2. Sphere: Faces-1 , Edges- 1 , Vertices- 0
3. Cuboid/rectangular prism: Faces- 6 , Edges- 12 , Vertices- 8
4. Triangular prism: Faces- , Edges- , Vertices-
5. Cone: Faces- 2 , Edges- 1 , Vertices- 1
6. Cube: Faces-6 , Edges- 12 , Vertices-8
7. Square pyramid: Faces- 5 , Edges- 8 , Vertices-5
8. Triangular pyramid/ tetrahedron: Faces-4 , Edges- 6 , Vertices- 4

Extra Resource

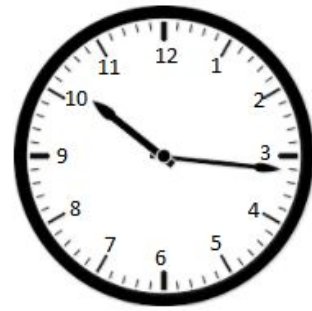


Worksheet 5:[Higher order of thinking]

To find the angle between two hands of a clock, the following method has to be followed

1. 12 in the clock is taken as reference as the hands start from 12 either in the noon or midnight.
2. Hours hand moves 0.5° for every minute[Moves 360° for every 12 hours, moves 360° for every 12×60 minutes. That is it moves $36001260 = 0.5^\circ$]
3. Minutes hand moves 6° for every minute
4. Now as in the clock, if we want to find out angle between the hands of clock when the time is 2:20
 - (i) Hours hand is moving for 2 hours and 24 minutes at the rate of 0.5° per minute.
That is $0.5 \times 60 \times 2$ for 2 hours and 0.5×20 for 20 minutes or
The movement of hours hand $= 0.5 \times 60 \times 2 + 0.5 \times 20 = 50^\circ$

Worksheet 5



(ii) Minutes hand is moving for 24 minutes at the rate of 6° for each minute

The movement of minutes hand = $6 \times 20 = 120^\circ$

(iii) So, angle between the hands = $500 - 1200 = 70^\circ$

[As integers are unknown to the students modulus can not be taught. So simply can say subtract bigger angle - smaller angle. But to the students who knows integers formula can be taught as modulus of angle made by hours hand - angle made by minutes hand]

5. Let us take one more example . Find angle between the hands of the clock
when the time is 10:16

(i) Hours hand is moving for 10 hours and 16 minutes at the rate of 0.5° per minute

The movement of hours hand = $0.5 \times 60 \times 10 + 0.5 \times 16 = 308^\circ$

Worksheet 5



(ii) Minutes hand is moving for 16 minutes at the rate of 6° per minute

The movement of minutes hand = $16 \times 6 = 96^{\circ}$

(iii) So, angle between the hands = $308^{\circ} - 96^{\circ} = 212^{\circ}$

(iv) The angle $212^{\circ} > 180^{\circ}$ which means the angle what we got is reflex angle between the hands as shown in the figure. So 212 must be subtracted from 360° to get the required angle. As a general note it can be said that if difference is $> 180^{\circ}$ then the angle must be subtracted from 360°

(v) The angle between the hands of the clock when the time is 10:16 = $360^{\circ} - 212^{\circ} = 148^{\circ}$

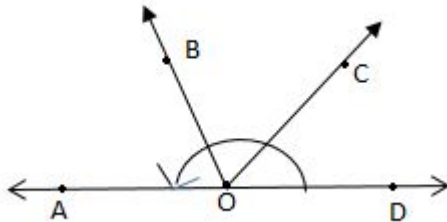
Practice Exercise

Practice exercise:

1. Find the angle between the hands of the clock [Pls look into the clock only to note down the time because the position of hour hand cannot be precise]



Find the missing Angle ?



i) What is the measure of $\angle AOD$

iii) If $\angle AOB = 70^\circ$, $\angle COD = 60^\circ$ then find $\angle BOC$

iv) If all the three angles are equal in measure find the measure of each?

Solutions for Worksheet 5

Practice exercise:

1. Angle between the hands of clock.

Time is 11:30

$$\text{Angle made by hours hand} = 11 \times 60 \times 0.5^{\circ} + 30 \times 0.5^{\circ} = 330^{\circ} + 15^{\circ} = 345^{\circ}$$

$$\text{Angle made by minutes hand} = 30 \times 6^{\circ} = 180^{\circ}$$

$$\text{Angle between the hands of the clock} = 345^{\circ} - 180^{\circ} = 165^{\circ}$$

Time is 4:08

$$\text{Angle made by hours hand} = 4 \times 60 \times 0.5^{\circ} + 8 \times 0.5^{\circ} = 120^{\circ} + 4^{\circ} = 124^{\circ}$$

$$\text{Angle made by minutes hand} = 8 \times 6^{\circ} = 48^{\circ}$$

$$\text{Angle between the hands of the clock} = 124^{\circ} - 48^{\circ} = 76^{\circ}$$

Time is 3:30

$$\text{Angle made by hours hand} = 3 \times 60 \times 0.5^{\circ} + 30 \times 0.5^{\circ} = 90^{\circ} + 15^{\circ} = 105^{\circ}$$

$$\text{Angle made by minutes hand} = 30 \times 6^{\circ} = 180^{\circ}$$

$$\text{Angle between the hands of the clock} = 180^{\circ} - 105^{\circ} = 75^{\circ}$$

Time is 4:30

Angle made by hours hand = $4 \times 60 \times 0.5^\circ + 30 \times 0.5^\circ = 120^\circ + 15^\circ = 135^\circ$

Angle made by minutes hand = $30 \times 6^\circ = 180^\circ$

Angle between the hands of the clock = $180^\circ - 135^\circ = 45^\circ$

2. Finding unknown angle

i) $\angle AOD$ is straight angle so it is 180°

ii) $\angle BOC = 180^\circ - (70^\circ + 60^\circ) = 180^\circ - 130^\circ = 50^\circ$

iii) All the three angles are equal so, measure of each angle = $180^\circ / 3 = 60^\circ$