

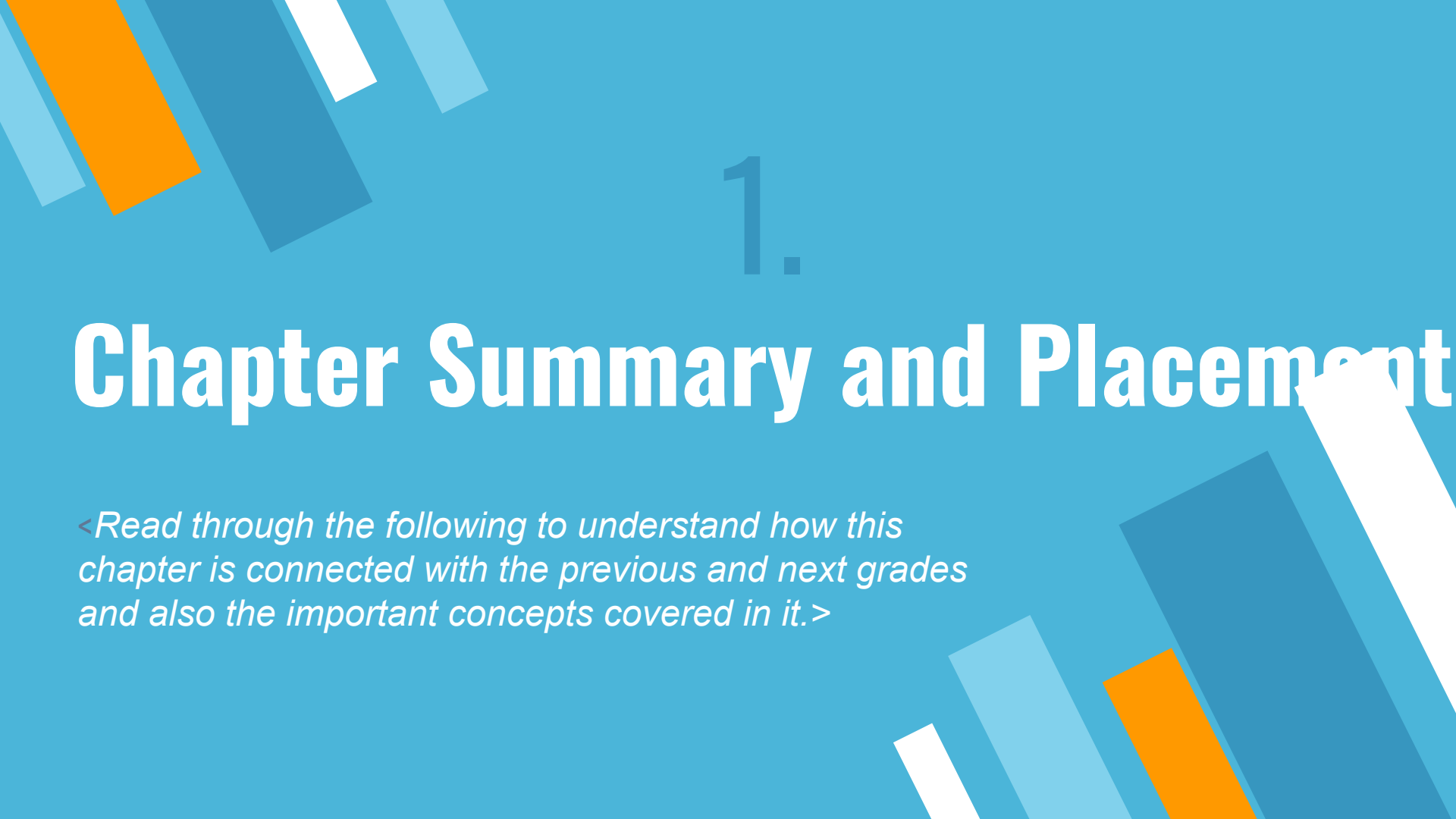


CHAPTER: Lines and Angles

Grade: 5

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.>

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- 
1. This chapter is connected to Basic geometrical ideas of grade VI
 2. Here we learn parallel lines and transversal, relation of angles made by them
 3. This concept connects to many areas of geometry in future grades



2.

LEARNING OUTCOMES

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



- 
- 
1. Identify lines, line segments, rays, and angles.
 2. Acquire knowledge of complementary, supplementary , adjacent and linear pair angles
 3. Acquire knowledge of transversal and angles made by it
 4. Examine the relation between angles made by transversal with parallel lines
 5. Use the concepts to solve problems of higher order of thinking[use worksheet 5]



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: Definitions

LO:

Identify lines, line segments, rays, and angles.

1. To make the student identify line, line segment angle, intersecting and parallel lines

Teacher Activity

Recap the definitions with examples

Check for understanding:

Pose questions related to definitions [only until angle] for practice

Resources Suggested

Blackboard, pen and paper

Resource 1 can be used for explanation

Subtopic and Learning Objective #2

Subtopic:

Complementary, supplementary, adjacent, linear pair and vertically opposite angles

LO:

Acquire the knowledge of complementary, supplementary, adjacent, linear pair and vertically opposite angles

1. To make student know about the above angles

Teacher Activity

Introduce complementary, supplementary, adjacent, linear pair angles with enough number of examples

Check for understanding:

- a) Complement of an angle is 79° then the angle is _____
- b) If two angles lie in different planes and their sum is 90° can they be called as complimentary?
- c) The angles $x-10^\circ$ and $190^\circ-x$ are _____ angles
- d) Measure of an angle which is 4 times it's supplement is _____
- e) If two complementary angles are in the ratio 2:3 then the measures of angles

- f) If two angles are supplementary and also vertically opposite then their measures are _____
- g) Sum of two linear pair angles is _____
- h) Adjacent angles are always linear pair [True/ False]
- i) Sum of angles around a point is _____

Resources Suggested

Blackboard, pen and paper

Resource 1 can be used for explanation

Subtopic and Learning Objective #3

Sub topic: Transversal and angles made by it

LO:

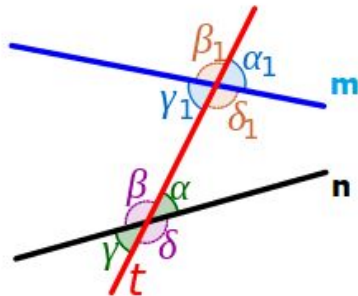
Acquire knowledge of transversal and angles made by it

1. To make student know about transversal and angles made by transversal

Teacher Activity

Introduce transversal and angles made by it while intersecting two lines. Give enough practice in identification and naming the angles.

Check for understanding:



If t is the transversal for m and n segments, identify and write Corresponding angles, alternate interior angles, alternate exterior angles, interior angles on the same side of transversal, exterior angles on the same side of transversal.

Resources Suggested

Blackboard, pen and paper

Resource 1 can be used for explanation

Subtopic and Learning Objective #4

Sub topic:Relation between angles made by transversal with parallel lines

LO:

Examine the relation between angles made by transversal with parallel lines

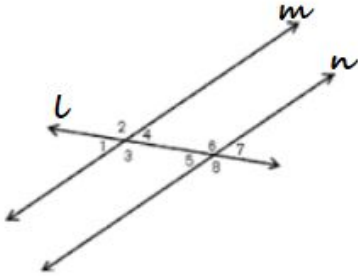
1. To make student find the relation between angles made by transversal with parallel lines

Teacher Activity

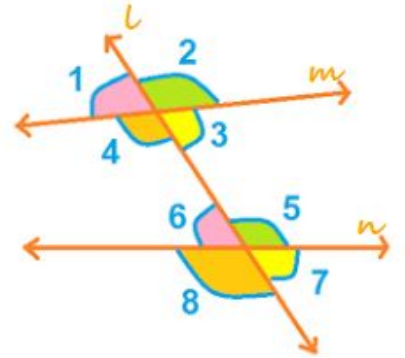
Explain the relation between the angles with proofs. Give enough practice in finding out relation and solving the problems related to it

Check for understanding:

a)



If l is transversal for the parallel lines m and n and measure of angle 1 is 55° find the measure of all angles?



Teacher Activity

In the above figure if color code given to the angles show equality in measures[same colored angles are equal].What can be said about lines m and n?

Resources Suggested

Blackboard, pen and paper

Resource 1 can be used for explanation

Resource 1



1) Point: A dot placed with sharp tip of pencil gives the idea of a point and is represented with capital letters



2) Line: An infinite set of points which extend indefinitely in both directions is called a line and is represented as below. It has no length, breadth or height. A line has no end points



RAY: An infinite set of points which extend indefinitely in one direction is called a ray and is represented as below.



It has no length, breadth or height. A ray has one endpoint. and is written as .

Note: alphabet representing starting point/endpoint, must be always written first.

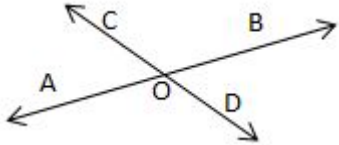
Resource 1



Line segment: A part of the line with two endpoints is called a line segment and is represented as below. It has length. A line segment has two endpoints but a line segment itself is made up of infinite points

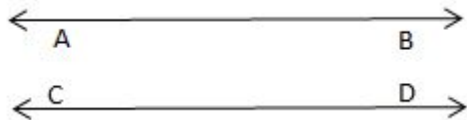


Intersecting lines : Two lines in a plane which meet each other at a point/Two lines in a plane having a common point are said to be intersecting and the common point is called point of intersection.



Parallel lines : Two lines in a plane which does not meet at any point are called parallel lines

Resource 1



- Note:
- a) Two lines in plane must be either intersecting or parallel to each other
 - b) Two intersecting lines in a plane determine a point in the plane
 - c) Two lines in a plane are said to be parallel if distance between them is equal
 - d) Infinite number of lines can be drawn through a point in a plane and only one line can be drawn through two points in a plane.

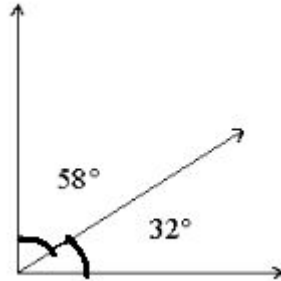
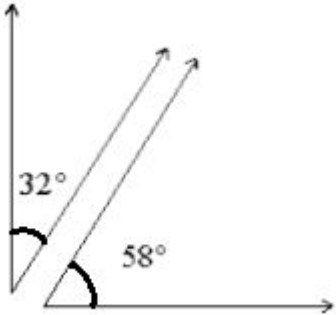
7) Angle : Union of two rays with same endpoint is called as an angle and is represented as $\angle ABC$ or $\angle B$ or $\angle CBA$



Resource 1

Angle is measured in degrees

8) **Complementary angles:** If sum of measures of two angles is 90° then they are called as complementary.

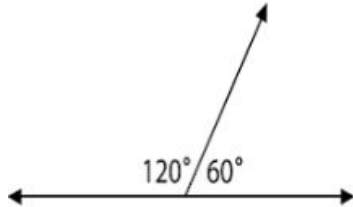


Resource 1

Note:

1. The location of the angles doesn't matter to be called as complementary; the only criterion is that the sum of two angles should be 90° . [That is if angles are in different planes and still if their sum is 90° then they can be called as complementary]
2. Two acute angles can be complementary.
3. Two obtuse can never be complementary.
4. One obtuse and one acute angle can never be complementary.
5. Two right angles cannot be complementary since one angle is itself equal to 90 degrees

9) **Supplementary angles** : If sum of measures of two angles is 180° then they are called as Supplementary.



Resource 1



Note:

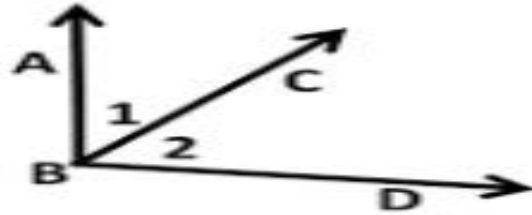
1. The location of the angles doesn't matter. To be called as complementary; the only criterion is that the sum of two angles should be 180° . [That is if angles are in different planes and still if their sum is 180° then they can be called as supplementary]
2. Two acute angles can never be supplementary.
3. Two obtuse can never be supplementary.
4. One obtuse and one acute angle can be supplementary.
5. Two right angles are always supplementary since the sum of two right angles is 180° .

Resource 1

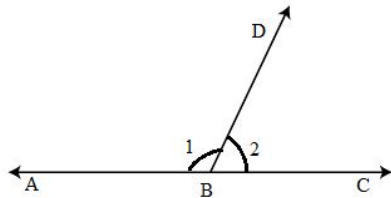
10) **Adjacent angles** : A pair of angles with common vertex, common arm, no common interior points and non common arms are on either side of common arm are called adjacent angles

$\angle 1$ and $\angle 2$ are adjacent angles whose common vertex is B and common

1.



11) **Linear Pair** : Adjacent angles whose non common arms are opposite rays is called a linear pair.



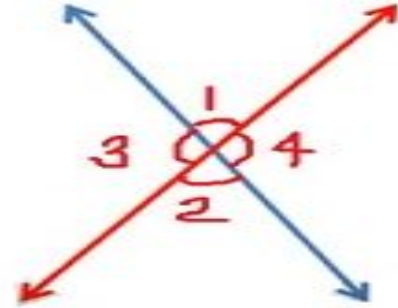
Resource 1

12) Vertically Opposite Angles : Opposite angles formed when two lines intersect are called Vertically Opposite angles

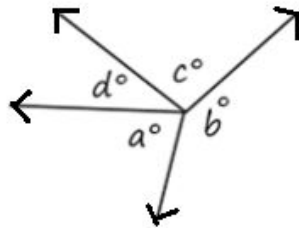
$\angle 1$ and $\angle 2$; $\angle 3$ and $\angle 4$ are Vertically opposite to each other

Note: Measures of vertically opposite angles are equal.

1.

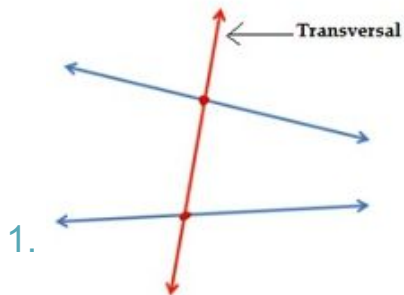


13) Angles around a point : Angles around a point is 360° .

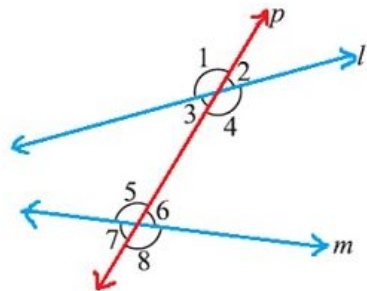


Resource 1

14) **Transversal** : A line intersecting two or more lines at different points is called transversal



Angles made by transversal : Four pairs of angles were made by a transversal intersecting two lines as shown below. Let us learn about them.

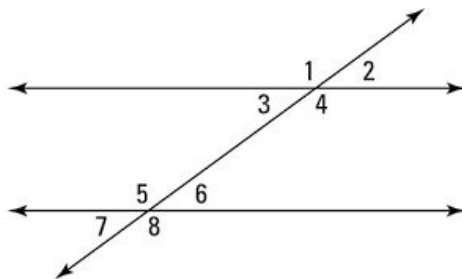


Interior angles	$\angle 3, \angle 4, \angle 5, \angle 6$
Exterior angles	$\angle 1, \angle 2, \angle 7, \angle 8$
Pairs of corresponding angles	$\angle 1$ and $\angle 5$ $\angle 2$ and $\angle 6$ $\angle 3$ and $\angle 7$ $\angle 4$ and $\angle 8$
Pairs of Alternate interior angles	$\angle 3$ and $\angle 6, \angle 4$ and $\angle 5$
Pairs of Alternate exterior angles	$\angle 1$ and $\angle 8, \angle 2$ and $\angle 7$
Pairs of interior angles on the same side of the transversal	$\angle 3$ and $\angle 5, \angle 4$ and $\angle 6$

Resource 1

16) Parallel lines and Transversal : When a transversal intersects two parallel lines then it was found that corresponding angles are equal $\angle 2 = \angle 6$; $\angle 1 = \angle 5$; $\angle 3 = \angle 7$; $\angle 4 = \angle 8$

We already know that vertically opposite angles are equal so, $\angle 2 = \angle 3$ but $\angle 3 = \angle 7$ so, $\angle 2 = \angle 7$
Similarly we can prove that $\angle 1 = \angle 8 \Rightarrow$



1.

Alternate exterior angles are equal

$\angle 1 = \angle 4$ and also $\angle 1 = \angle 5$ So $\angle 4 = \angle 5$, Similarly $\angle 3 = \angle 6 \Rightarrow$ **Alternate interior angles are equal**

$\angle 2 + \angle 4 = 180^\circ$ but $\angle 2 = \angle 6$ So, $\angle 4 + \angle 6 = 180^\circ$. Similarly we can prove that $\angle 3 + \angle 5 = 180^\circ$

That is **Interior angles on the same side of transversal are supplementary**

Similarly Exterior angles on the same side of transversal are supplementary

Resource 1

Note:

1. When a transversal cuts two lines, such that pairs of corresponding angles are equal, then the lines have to be parallel.
2. When a transversal cuts two lines, such that pairs of alternate interior angles are equal, the lines have to be parallel.
3. When a transversal cuts two lines, such that pairs of interior angles on the same side of the transversal are supplementary, the lines have to be parallel.



4. 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

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

Answer the following:

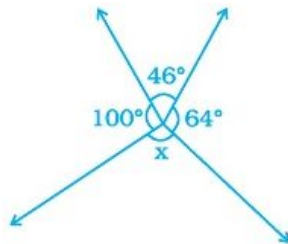
1. A dot placed with sharp tip of pencil gives the idea of a _____
2. An infinite set of points which extend indefinitely in both directions is called _____
3. An infinite set of points which extend indefinitely in one direction is called _____
4. A part of the line with two endpoints is called _____
5. A line has _____ end points.
6. A line segment has _____ endpoints.
7. A ray has _____ endpoints.
8. Two lines in plane must be either _____ or _____ to each other
9. Two lines in a plane having a common point are said to be _____
10. Two intersecting lines in a plane determine a _____
11. Two lines in a plane are said to be parallel if _____ between them is equal
12. Union of two rays with same starting or end point is called _____
13. Measure of an angle is _____

Worksheet 2

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

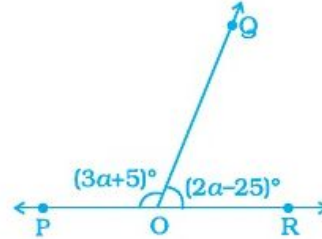
Answer the following:

1. If sum of two angles is 90° then they are called as _____ angles
2. If two angles are said to be supplementary if _____
3. Define adjacent angles?
4. _____ angles with common vertex , common arm and non common arms are opposite rays is called linear pair.
5. _____ angles are always supplementary
6. Opposite angles formed when two lines intersect are called _____ angles
7. The value of x is _____

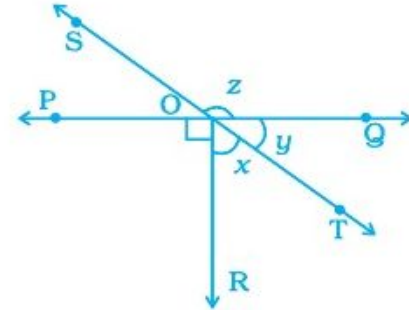


Worksheet 2

1. Find a and hence the angles.



2. Lines PQ and ST intersect at O and ratio of x and y is $2:3$
 $\angle POR$ is 90° Find the angles x , y , z and $\angle POS$

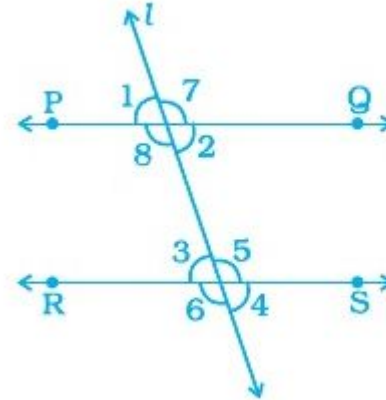


Worksheet 3

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

Answer the following:

1. From the given figure Identify :
 - Corresponding angles
 - Alternate interior angles
 - Alternate exterior angles
 - Interior angles on the same side of transversal
 - Exterior angles on the same side of transversal

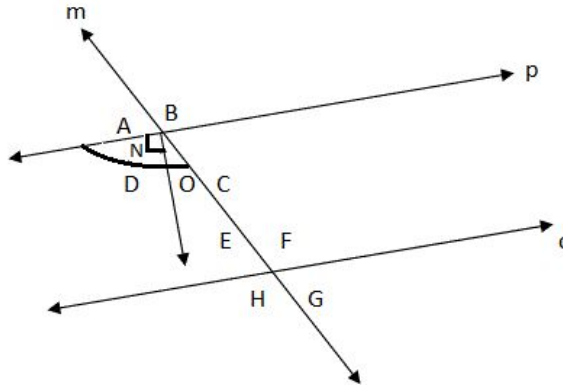


Worksheet 4

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

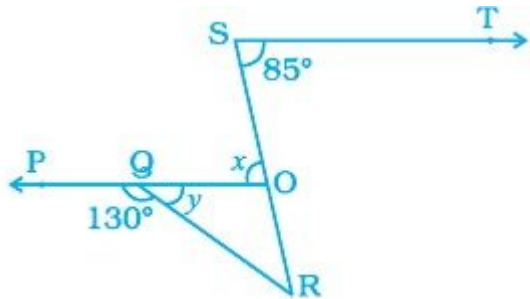
Answer the following:

1. If p and q are two parallel lines intersected by transversal m and $\angle E$ is measured as 60° then find all the other angles

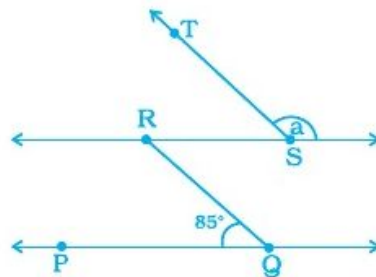


Worksheet 5

1. If $PO \parallel ST$ Find the measures of x and y

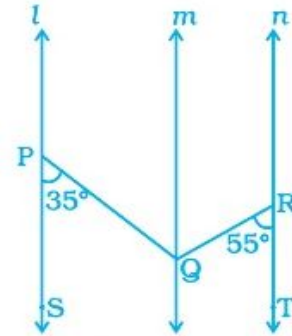
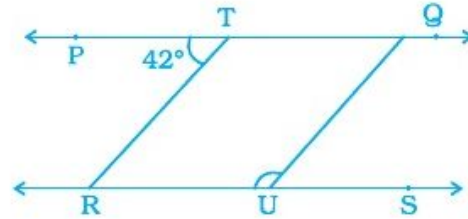


2. If $PQ \parallel RS$ and $RQ \parallel ST$, then find measure of a ?



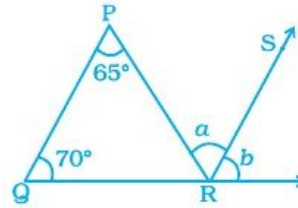
Worksheet 5

3. If $PQ \parallel RS$ and $RT \parallel QU$ then find the value of $\angle RUQ$
4. $l \parallel m \parallel n$ then find reflex $\angle PQR$

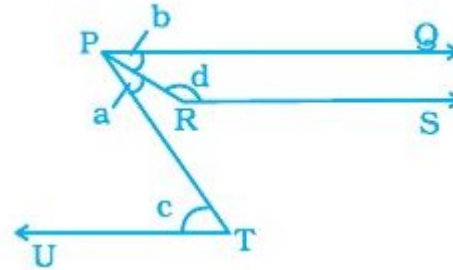


Worksheet 5

5. $PQ \parallel RS$ then find measures of a and b ?



6. 1. If $PQ \parallel RS \parallel UT$ then
- If $c = 57^\circ$ and $a = c/3$, find the value of d ?
 - If $c = 75^\circ$ and $a = \frac{2}{3}$ of c find b .





5. SOLUTIONS

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



Worksheet 1

1. Point
2. Line
3. Ray
4. Line segment
5. No
6. 2
7. 1
8. Intersecting, parallel
9. Intersecting
10. Point
11. Distance
12. Angle
13. Degrees

Worksheet 2

1. Complementary
2. Sum of the angles is 180°
3. A pair of angles with common vertex, common arm, no common interior points and non common arms are on either side of common arm are called adjacent angles
4. Adjacent angles
5. Linear pair
6. Vertically opposite
7. 150°
8. $a=40^{\circ}$ and angles are 125° and 55°
9. $x=40^{\circ}$, $y=60^{\circ}$, $z=120^{\circ}$, $\angle POS=60^{\circ}$.

Worksheet 3

Corresponding angles: $\angle 1$ and $\angle 3$; $\angle 7$ and $\angle 5$; $\angle 8$ and $\angle 6$; $\angle 2$ and $\angle 4$

Alternate interior angles: $\angle 2$ and $\angle 3$; $\angle 8$ and $\angle 5$

Alternate exterior angles: $\angle 1$ and $\angle 4$; $\angle 7$ and $\angle 6$

Interior angles on the same side of transversal: $\angle 8$ and $\angle 3$; $\angle 2$ and $\angle 5$

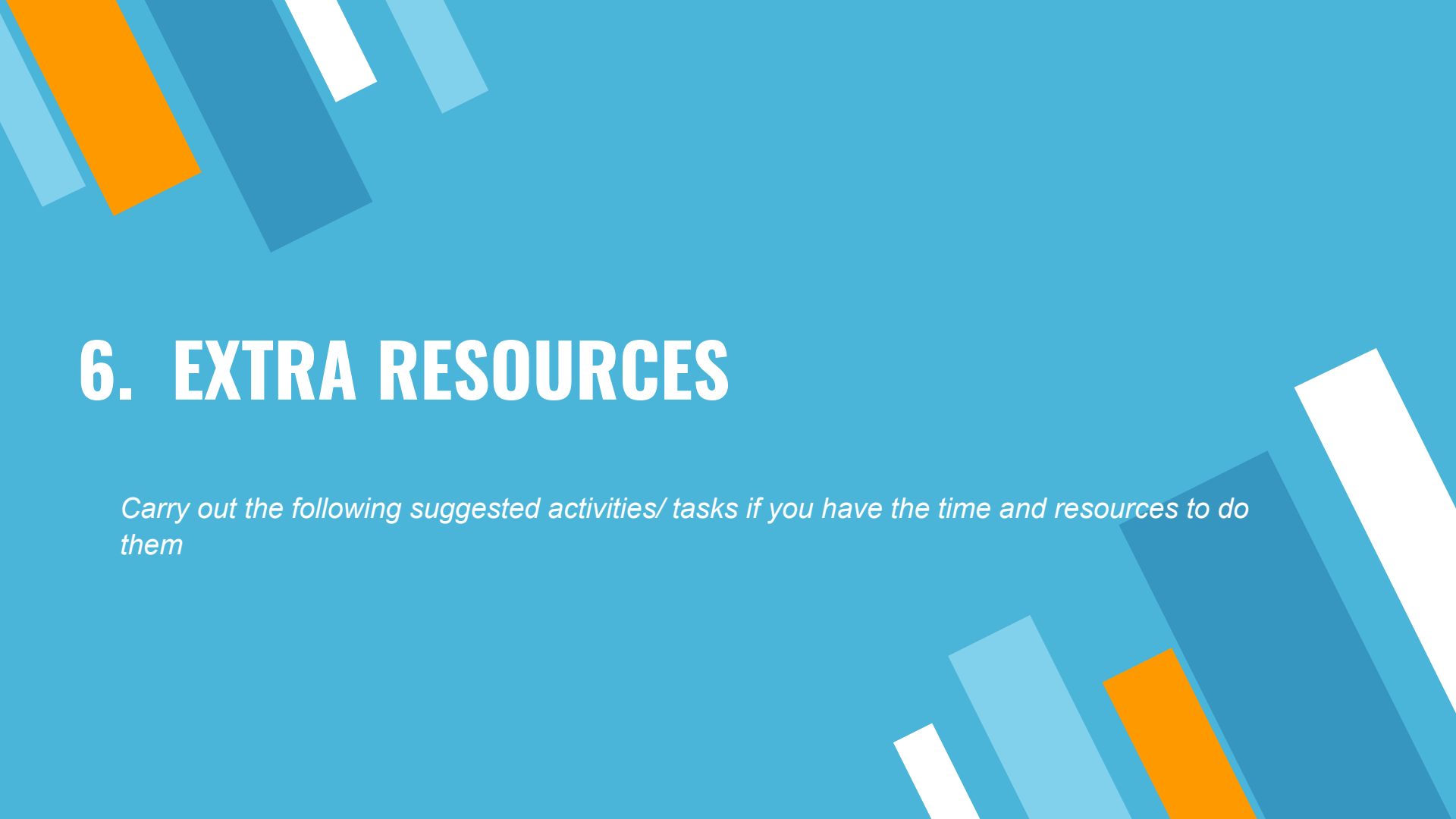
Exterior angles on the same side of transversal: $\angle 1$ and $\angle 6$; $\angle 7$ and $\angle 4$

Worksheet 4

1. $A = 60^0$
 $B = 120^0$
 $C = 60^0$
 $D = 120^0$
 $E = 60^0$
 $F = 120^0$
 $G = 60^0$
 $H = 120^0$
 $O = 30^0$
 $N = 90^0$

Worksheet 5

1. $x = 85^\circ$ and $y = 50^\circ$
2. $a = 95^\circ$
3. $\angle RUQ = 138^\circ$
4. $\angle PQR = 270^\circ$
5. $a = 65^\circ$ $b = 70^\circ$
6. (i) $d = 142^\circ$ (ii) $b = 45^\circ$



6. EXTRA RESOURCES

Carry out the following suggested activities/ tasks if you have the time and resources to do them

Teacher can use these videos if time and facilities permit:

1. <https://www.youtube.com/watch?v=6RMN5Pf1fHU> - parallel lines and transversal
2. <https://www.youtube.com/watch?v=e4o7X6LyX-I> - Parallel and Perpendicular Lines, Transversals, Alternate Interior Angles, Alternate Exterior Angles