✧ PARALLEL LINES AND Transversal ✧

Learning Objectives:

♦   Parallel Lines

♦   Intersecting Lines

♦   Transversal

♦   Angles Between the lines

PROPERTIES OF ADJACENT AND VERTICALLY OPPOSITE ANGLES:

When two straight lines intersect :

i) The sum of each pair of adjacent angles is always 180^0

      i.e $\angle AOD + \angle DOB = 180^0$

               $\angle BOD + \angle BOC = 180^0$

               $\angle BOC + \angle COA = 180^0$

               $\angle COA + \angle AOD = 180^0$

ii) The vertically opposite angles are always equal

      i.e. $\angle AOC = \angle BOD \ and \ \angle BOC = \angle AOD$
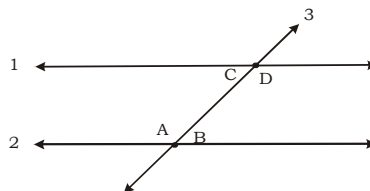
Parallel Lines :

Two lines in the same plane which never intersect are called parallel lines. We say that two line segments are parallel if the lines that they lie on are parallel. If line 1 is parallel to line 2, we write this as line 1 ∥ line 2

When two line segments DC and AB lie on parallel lines, we write this as segment DC ∥ segment AB.
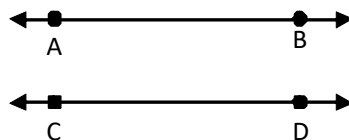
**Transversal:** A transversal is a line that intersects two or more lines.

Alternate Interior Angles: For any pair of parallel lines 1 and 2,that are both intersected by a third line,such as line 3 in the diagram below, angle A and angle D are called alternate interior angles.Alternate interior angles have the same degree measurement. Angle B and angle C are also alternate interior angles.

Alternate Exterior Angles : For any pair of parallel lines 1 and 2, that are both intersected by a third line, such as line 3 in the diagram below, angle A and angle D are called alternate exterior angles. Alternate exterior angles have the same degree measurement. Angle B and angle C are also alternate exterior angles
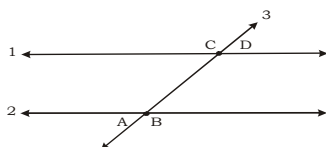
Corresponding Angles : For any pair of parallel lines 1 and 2, that are both intersected by a third line, such as line 3 in the diagram below, angle A and angle C are called corresponding angles. Corresponding angles have the same degree measurement. Angle B and angle D are also corresponding angles.
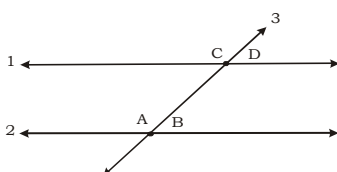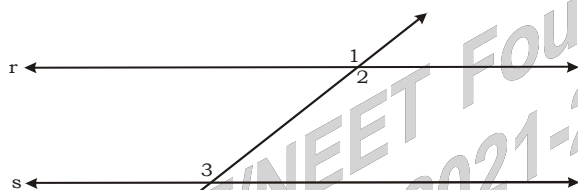

How to tell if two lines are parallel

There are four different ways to see if two lines are parallel.
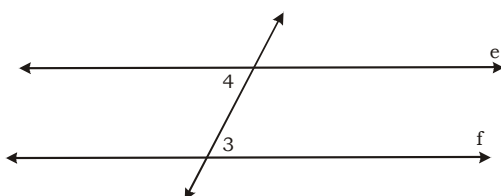
1. If two lines are cut by a transversal, and one pair of corresponding angles are congruent (congruent angles have the same measure), then the lines are parallel.
   **Example:** If angles *1* and *3* are congruent, then the lines *r* and *s* parallel.

2. If two lines are cut by a transversal, so that one pair of alternate interior angles are congruent, then lines are parallel.
   Example: Line *e* is parallel to line *f* because angle *4* is congruent to angle *3*.

3. If two lines are cut by a transversal so that a pair of interior angles on the same side of the transversal are supplementary, then the lines are parallel.
   Example: The lines a and b are parallel because angles 1 and 2 are supplementary.
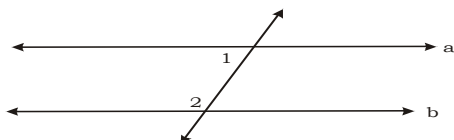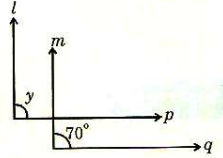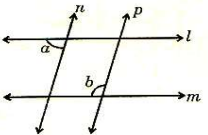

4. If two lines are perpendicular to another line, and they (the two lines) are in the same plane, then they are parallel.
   Be careful with this rule because it is possible to have two lines that are perpendicular to a third line that are not in the same plane.

TEACHING TASK

MCQ's with single correct answer type.

1. State whether the statements are false.
    A) A line is not parallel to itself
    B) Two line segments in a plane either intersect (or) are parallel
    C) If l is perpendicular to m and m is perpendicular to n then l is parallel to n.
    D) Angle between two parallel lines is a zero angle.

2. Given a line and a point not on it, number of lines parallel to the given line through the given point is...
    A) 1   B) 4   C) 2   D) 3

3. Lines parallel to the same line are...
    A) perpendicular   B) parallel   C) intersecting   D) Concurrent

4. In the given figure l//m and p//q then the value of y is...

    A) 110⁰   B) 60⁰   C) 70⁰   D) 140⁰

5. In the adjoining figure, if l //m , n//p and $\angle a = 85^0$ then $\angle b$ =....

    A) 100⁰   B) 95⁰   C) 85⁰   D) 90⁰

6. If two straight lines are perpendicular to the same line then they are ....to each other.
    A) perpendicular   B) parallel   C) intersect   D) none

7. Two alternate angle are $(a+10)^0$ and $(2a-50)^0$. If two parallel lines are intersected by a transversal. The value of 'a' is....
    A) 40⁰   B) 60⁰   C) 70⁰   D) None

8. Two co-interior angles are $(a+30)^0$ and $(a+70)^0$. If two parallel lines ae intersected by a transversal the value of 'a' is...
    A) 40⁰   B) 100⁰   C) 60⁰   D) None

9. Two co-interior angles are in the ratio 2 : 7. If two parallel lines are intersected by a transversal then the smaller angle is...
    A) 20⁰   B) 40⁰   C) 50⁰   D) None

10. A co-interior angle is double the other co-interior angle. If two parallel lines are intersected by a transversal. The greater angle is...
    A) 120⁰   B) 150⁰   C) 140⁰   D) None
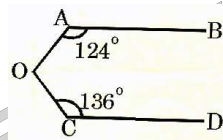
11.   l,m,n are three parallel lines, a,b are....
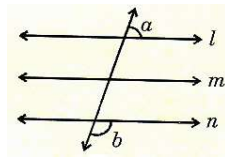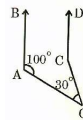

A) Complementary   B) Equal   C) Supplementary   D) None

12.   In the given fig. AB // CD. If $\angle BAO = 60^0$ and $\angle OCD = 100^0$ then $\angle AOC =..$

A) 70^0 B) 60^0 C) 50^0 D) 40^0
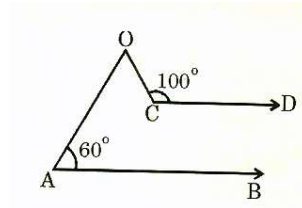
13.   In the given fig. AB // CD. If $\angle OAB = 124^0$, $\angle OCD = 136^0$ then $\angle AOC =...$

A) 80^0 B) 90^0 C) 100^0 D) 110^0

14.   In the given figure AB // CD. If $\angle BAO = 100^0$, $\angle AOC = 30^0$ $\angle OCD =$

A) 130^0 B) 150^0 C) 80^0 D) 100^0

15.   For what value of 'x' , l //m?

A) 50^0 B) 70^0 C) 60^0 D) 45^0
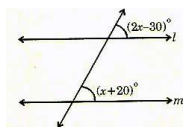
16.   For what value of x, l //m ?
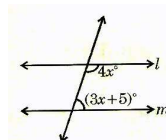
A) 35^0 B) 30^0 C) 25^0 D) 20^0

17.   In the figure AB // CD, if $\angle APQ = 70^0$ and $\angle PRD = 120^0$ then $\angle QPR =$

A) 50^0 B) 60^0 C) 40^0 D) 35^0
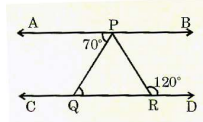
II   MCQ's with more than one correct answer.

1.   Two coplanar lines must be either....
       A) parallel   B) intersecting   C) perpendicular   D) Coinside

2.   If a transversal intersects a pair of parallel lines then the interior angles on the same side of
       the transversal...
       A) supplementary   B) Complementary   C) 180^0 D) 90^0

3.   If AB // CD // EF. where l and m are transversals. then

       A) x=138^0 B) y = 128^0 C) x=128^0 D) z=138^0
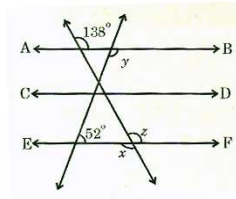
4.   If a Transversal intersects a pair of parallel lines, then the interior angles on the either side of
       the transversal
       A) Supplementary   B)Complementary   C)Equal   D)180^0

LEARNER'S TASK

◆▐▐◆ BEGINNERS (Level - I) ◆▐▐◆

I.   MCQ's With Only one answer is correct:

1. $1^0 =$_____
       A) $60^{\parallel}$ B) $60^{\mid}$ C) A & B   D) None

2. $1^{\mid} =$_____
       A) $60^{\parallel}$ B) $60^{\mid}$ C) A & B   D) None

3.   The measure of an angle is 90^0
       A) Right angle   B) Complete angle
       C) Acute angle   D) Obtuse angle

4.   An angle whose measure is more than 180^0 but less than 360^0
       is called_____angle.
       A) Right angle   B) Reflex angle
       C) Acute angle   D) Obtuse angle

5.   The sum of the measures of two angles is 90^0 are called_____
       A) Supplementary   B) complementary
       C) A & B   D) None

6.   The sum of the measures of supplementary angles _____
       A)90^0 B)180^0 C) 270^0 D) 360^0

7.   The number of degrees in 2 right angles _____
       A)90^0 B)180^0 C) 270^0 D) 360^0

8. The number of degrees in 3/2 right angles _____
    A)90^0 B)180^0 C) 270^0 D) 135^0
9. The vertex of the angle lies_____
    A) interior   B) exterior   C) on the angle   D) inside the angle
10. Sum of pair of adjacent angles are 180^0 the lines forms
    A)linear pair   B)intersecting   C)parallel   D)none

◆ ⊢⊣ ◆ <u>ACHIEVERS (Level - II)</u>   ◆ ⊢⊣ ◆

I   MCQ's with one or more than one option.
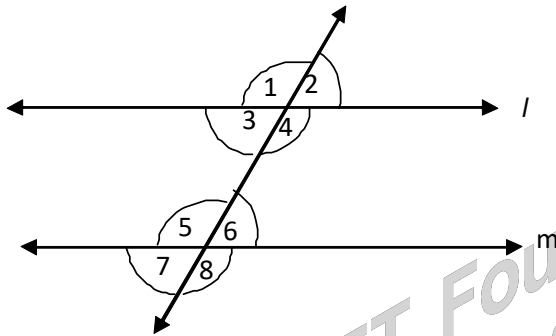
11. Linear pair of angles=..............
    A)$\angle 5, \angle 8$ B)$\angle 2, \angle 8$ C)$\angle 3, \angle 5$ D)$\angle 3, \angle 4$
12. Vertically opposite angles=...............
    A)$\angle 5, \angle 8$ B)$\angle 3, \angle 5$ C)$\angle 2, \angle 3$ D)$\angle 3, \angle 4$
13. $\angle 1, \angle 7$ are...........
    A)linear pair   B)vertically opposite
    C)corresponding   D)co-exterior
14. Co-interior angles=..............
    A)$\angle 6, \angle 4$ B)$\angle 3, \angle 5$ C)$\angle 1, \angle 2$ D)none
15. Corrosponding angles=...............
    A)$\angle 1, \angle 6$ B)$\angle 4, \angle 8$ C)$\angle 2, \angle 6$ D)$\angle 3, \angle 4$
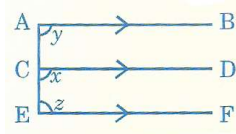
II   Match the following.

Column - I	Column - II
a) distance between parallel lines	1) 180^0
b) angle between parallel lines	2) l // n
c) l // m and m//n then	3) l $\perp$ n
d) l //m and m $\perp$ n then	4) 0^0
e) Number of lines parallel to the given line	5) always constant
	6) infinite

A) a-5,b-4,c-2,d-3 e-6   B) a-5,b-2,c-2,d-3 e-1
C) a-4,b-5,c-2,d-3 e-6   D) a-5,b-4,c-3,d-2 e-6

III   Comprehension.

in the adjacent figure

17.   If $z = 70^0$ then $x = ...$ $y = ...$
       A) $110^0, 110^0$ B) $90^0, 110^0$ C) $90^0, 90^0$ D) $100^0, 90^0$

18.   If $3z = 2y$ then $x = ...$
       A) 110^0 B) 108^0 C) 98^0 D) 118^0

19.   If $x = 2(z+15)^0$ then $y = ...$
       A) 110^0 B) 120^0 C) 130^0 D) 140^0

◄∎∎ EXPLORERS (Level - III) ◄∎∎

Solve the following.

1.   What is the measures of the complement of each of the following Angles.
       i) 45° ii) 65° iii) $20^0 + y^0$
       iv) 1/2 of 60^0 v) 1/5 of 160^0 vi) 2/5 of 70^0

2.   What will be the measures of the supplement of each one of the following angles ?
       i) 100° ii) 90° iii) $(x-30)^0$
       iv) $20^0 + y^0$ v) 50% of 120^0 vi) 1/3 of 150^0

3.   Find the angle which is equal to its complement ?

4.   Find the angle which is equal to its supplement ?

5.   Find the complement of each of the following angles.
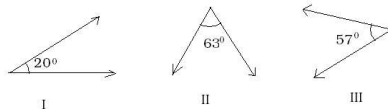
6.   Find the supplement of each of the following angles.

7.   Identify which of the following pairs of angles are complementary and which are supplementary.
       i) $65^o, 115^o$ ii) $63^o, 27^o$ iii) $112^o, 68^o$
       iv) $130^o, 50^o$ v) $45^o, 45^o$ vi) $80^o, 10^o$

8.   The difference in the measures of two complementary angles is 12°. Find the measures of the angles.

9.   Find the angle which is 44^0 more than its supplement.

10.   Find the measure of an angle. Which is 24° more than its complement ?

11.   Find the angle which is one - fourth of its supplement ?

12.   Find the angle which is one fourth of its complement ?

13.   Two supplementary angles are in the ratio 7:8. Find the angles.

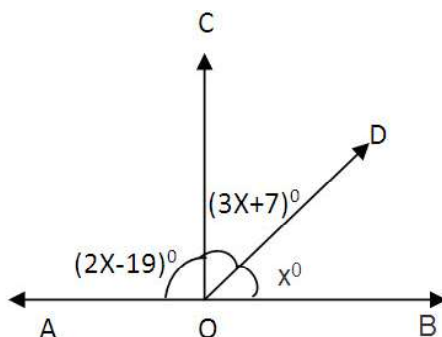14.   Two complementary angles are in the ratio 7:11, find the angles ?

15.   In the given figure if $\angle 1 = 30^o$. *Find* $\angle 2$ *and* $\angle 3$?
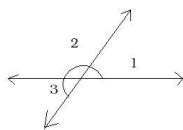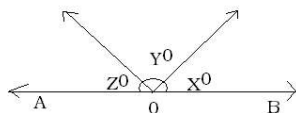
16.   Indicate which pairs of angles are
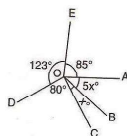   i) vertically opposite   ii) linear pairs
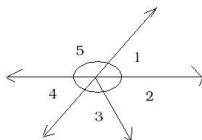
17.   In the adjoining figure, AOB is a straight line.   Find the value of x Hence find
        $\angle AOC, \angle COD,$ and $\angle BOD.$
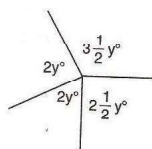
18.   In the adjoining figure , AOB is a straight line.
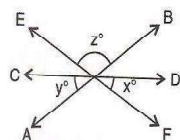   If x : y : z = 6 : 5 : 4 find the values of x,y and z ?
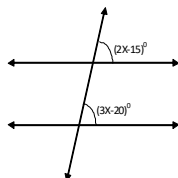
19.   In the given figure, find angle AOB,angle BOC
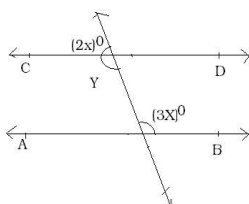
20.   Find each angle shown in th figure.

21.   AB,CD and EF are three lines intersecting at the same point.
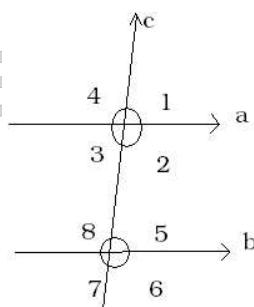   a)find x if y=45⁰ and z=90⁰
        b)find a, if x=3a y=5x and z=6x.

22.   In the following figure, AB//CD. Find the values of x.

23.   In the adjoining figure AB//CD. Find the values of x and y.
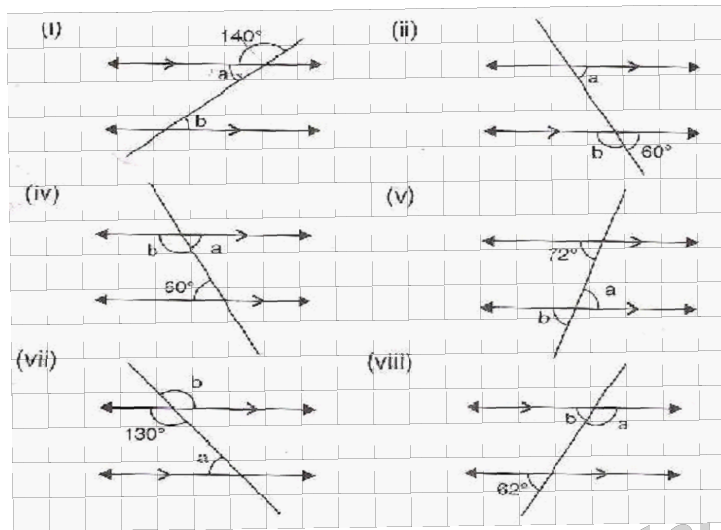

24.   In the adjoining figure identify

a)The pairs of corresponding angles
b)The pairs of alternate interior angles
c)The pairs of co-interior angles
 d)The pairs of vertically opposite angles.
e)linear pairs of angles.
f)The pairs of alternate exterior angles
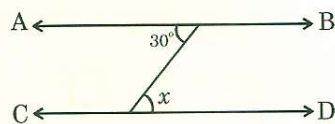g)The pairs of co-exterior angles.

25.   Find a,b from the following

◄ ▮▮▮ ► **RESEARCHERS (Level - IV)** ◄ ▮▮▮ ►

1.   AB // CD then x = ...   [Ramanujan - 14]

A) 60^0 B) 15^0 C) 30^0 D) 35^0
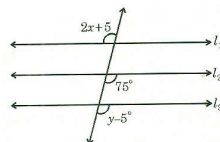
2.   The wo supplementary angles differ by 40^0 one of them is... [Ramanujan-14]

A) 110^0 B) 100^0 C) 90^0 D) 80^0
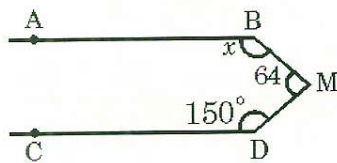
3.   From the given figure, value of 10x - 4y = ...   [A.S.Rao - 14]

A)115^0 B) 30^0 C) 45^0 D) 75^0
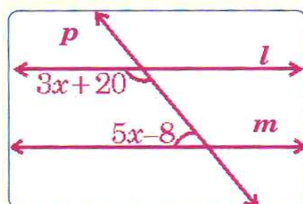
4.   In the given fig. find the 'x'.   [APAMT - 09]

A) 146^0 B) 156^0 C) 162^0 D) 90^0

5.   In the adjacent fig. I , m are parallel. P is transversal then find 'x' [Ramanujan-13]

KEY

ΦΦ **TEACHING TASK :**

I.   1) A   2)A   3)B   4)C   5)B   6)B   7)B   8)A   9)B   10)A   11)C   12)D   13)C   14)A   15)A   16)C   17)A

II   1)A,B,C,D   2)A,C   3)A,B,D   4)A,D

ΦΦ **LEARNER'S TASK :**

☐ **BEGINNERS :**

I.   1)B   2)A   3)A   4)B   5)B   6)B   7)B   8)D   9)C   10)A

☐ **ACHIEVERS :**

11)D   12)A,C   13)D   14)A,B   15)B,C

Matching and comprehension
16)A   17)A   18)B   19)C