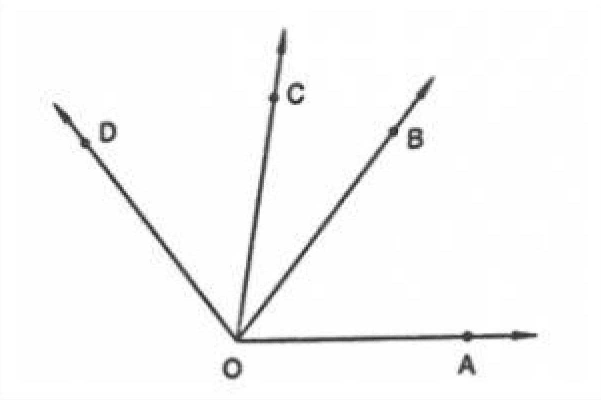
Exercise 14.1

Q1. Write down each pair of adjacent angles shown in Figure



Sol:

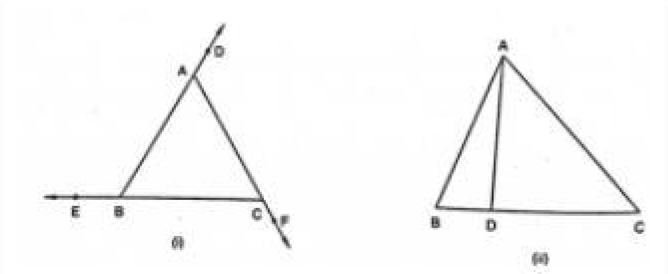
The angles that have common vertex and a common arm are known as adjacent angles

The adjacent angles are :

$\angle DOC$ and $\angle BOC$

$\angle COB$ and $\angle BOA$

Q2. In figure, name all the pairs of adjacent angles.



Sol:

In fig (i), the adjacent angles are

$\angle EBA$ and $\angle ABC$

$\angle ACB$ and $\angle BCF$

$\angle BAC$ and $\angle CAD$

In fig(ii), the adjacent angles are

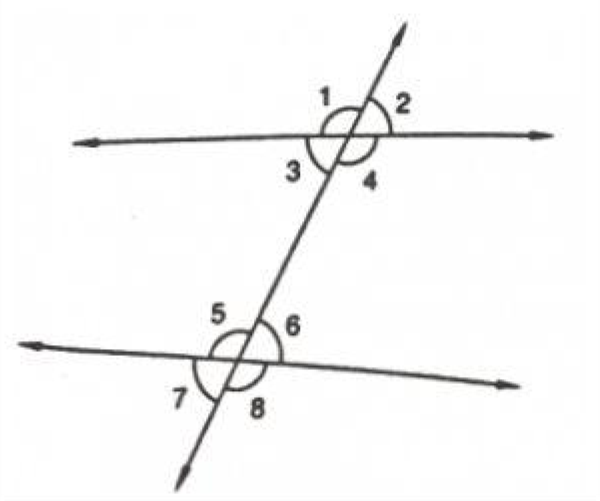
$\angle BAD$ and $\angle DAC$

$\angle BDA$ and $\angle CDA$

Q3. In fig , write down

(i) each linear pair

(ii) each pair of vertically opposite angles.



Sol:

(i) The two adjacent angles are said to form a linear pair of angles if their non – common arms are two opposite rays.

$\angle 1$ and $\angle 3$

$\angle 1$ and $\angle 2$

$\angle 4$ and $\angle 3$

$\angle 4$ and $\angle 2$

$\angle 5$ and $\angle 6$

$\angle 5$ and $\angle 7$

$\angle 6$ and $\angle 8$

$\angle 7$ and $\angle 8$

(ii) The two angles formed by two intersecting lines and have no common arms are called vertically opposite angles.

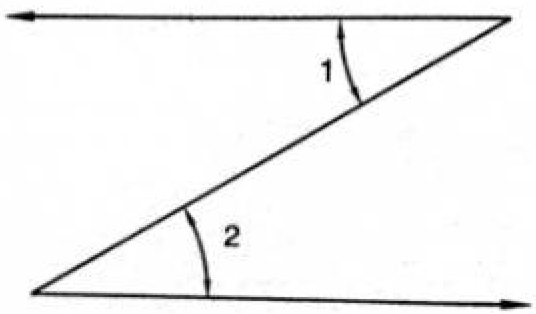
$\angle 1$ and $\angle 4$

$\angle 2$ and $\angle 3$

$\angle 5$ and $\angle 8$

$\angle 6$ and $\angle 7$

Q4. Are the angles 1 and 2 in figure adjacent angles?



Sol:

No, because they do not have common vertex.

Q5. Find the complement of each of the following angles:

(i) 35°

(ii) 72°

(iii) 45°

(iv) 85°

Sol:

The two angles are said to be complementary angles if the sum of those angles is 90°

Complementary angles for the following angles are :

(i) $90^\circ - 35^\circ = 55^\circ$

(ii) $90^\circ - 72^\circ = 18^\circ$

(iii) $90^\circ - 45^\circ = 45^\circ$

(iv) $90^\circ - 85^\circ = 5^\circ$

Q6. Find the supplement of each of the following angles :

(i) 70°

(ii) 120°

(iii) 135°

(iv) 90°

Sol:

The two angles are said to be supplementary angles if the sum of those angles is 180°

(i) $180^\circ - 70^\circ = 110^\circ$

(ii) $180^\circ - 120^\circ = 60^\circ$

(iii) $180^\circ - 135^\circ = 45^\circ$

(iv) $180^\circ - 90^\circ = 90^\circ$

Q7. Identify the complementary and supplementary pairs of angles from the following pairs

(i) $25^\circ, 65^\circ$

(ii) $120^\circ, 60^\circ$

(iii) $63^\circ, 27^\circ$

(iv) $100^\circ, 80^\circ$

Sol:

(i) $25^{\circ}+65^{\circ}=90^{\circ}$ so, this is a complementary pair of angle.

(ii) $120^{\circ}+60^{\circ}=180^{\circ}$ so, this is a supplementary pair of angle.

(iii) $63^{\circ}+27^{\circ}=90^{\circ}$ so, this is a complementary pair of angle.

(iv) $100^{\circ}+80^{\circ}=180^{\circ}$ so, this is a supplementary pair of angle.

Here, (i) and (iii) are complementary pair of angles and (ii) and (iv) are supplementary pair of angles.

Q8. Can two obtuse angles be supplementary, if both of them be

(i) obtuse?

(ii) right?

(iii) acute?

Sol:

(i) No, two obtuse angles cannot be supplementary

Because, the sum of two angles is greater than 90 degrees so their sum will be greater than 180degrees.

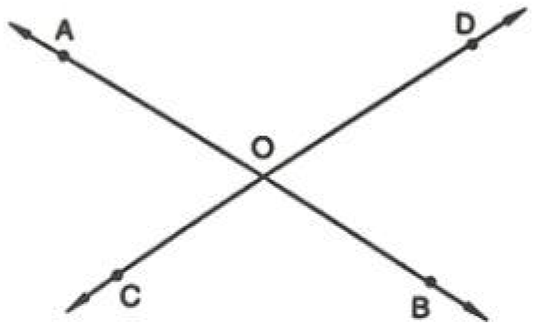
(ii) Yes, two right angles can be supplementary

Because, $90^{\circ}+90^{\circ}=180^{\circ}$

(iii) No, two acute angle cannot be supplementary

Because, the sum of two angles is less than 90 degrees so their sum will also be less tha 90 degrees.

Q9. Name the four pairs of supplementary angles shown in Fig.



Sol:

The supplementary angles are

$\angle AOC$ and $\angle COB$

$\angle BOC$ and $\angle DOB$

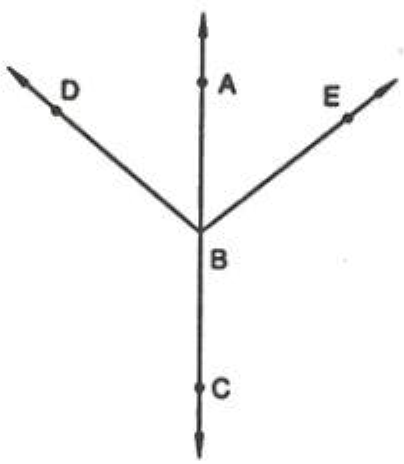
$\angle BOD$ and $\angle DOA$

$\angle AOC$ and $\angle DOA$

Q10. In Figure, A,B,C are collinear points and $\angle DBA = \angle EBA$.

(i) Name two linear pairs.

(ii) Name two pairs of supplementary angles.



Sol:

(i) Linear pairs

$\angle ABD$ and $\angle DBC$

$\angle ABE$ and $\angle EBC$

Because every linear pair forms supplementary angles, these angles are

$\angle ABD$ and $\angle DBC$

$\angle ABE$ and $\angle EBC$

Q11. If two supplementary angles have equal measure, what is the measure of each angle?

Sol:

Let p and q be the two supplementary angles that are equal

$\angle p = \angle q$

So,

$\angle p + \angle q = 180^\circ$

=> $\angle p + \angle p = 180^\circ$

=> $2\angle p = 180^\circ$

=> $\angle p = \frac{180^\circ}{2}$

=> $\angle p = 90^\circ$

Therefore, $\angle p = \angle q = 90^\circ$

Q12. If the complement of an angle is 28°, then find the supplement of the angle.

Sol:

Here, let p be the complement of the given angle 28°

Therefore, $\angle p + 28^\circ = 90^\circ$

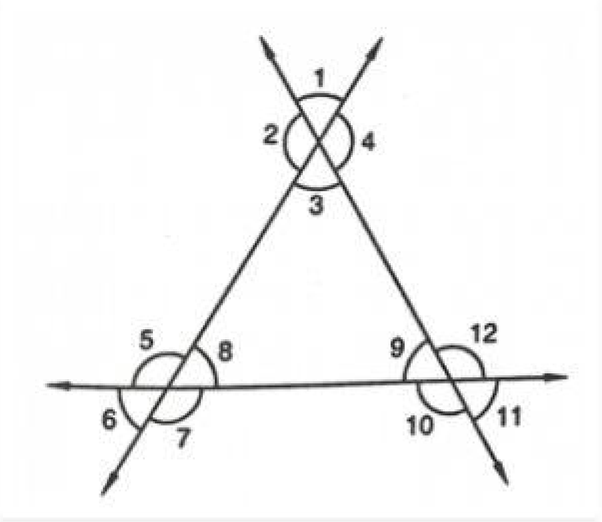
=> $\angle p = 90^\circ - 28^\circ$

$= 62^\circ$

So, the supplement of the angle = $180^\circ - 62^\circ$

$= 118^\circ$

Q13. In Fig. 19, name each linear pair and each pair of vertically opposite angles.



Sol:

Two adjacent angles are said to be linear pair of angles, if their non-common arms are two opposite rays.

$\angle 1$ and $\angle 2$

$\angle 2$ and $\angle 3$

$\angle 3$ and $\angle 4$

$\angle 1$ and $\angle 4$

$\angle 5$ and $\angle 6$

$\angle 6$ and $\angle 7$

$\angle 7$ and $\angle 8$

$\angle 8$ and $\angle 5$

$\angle 9$ and $\angle 10$

$\angle 10$ and $\angle 11$

$\angle 11$ and $\angle 12$

$\angle 12$ and $\angle 9$

The two angles are said to be vertically opposite angles if the two intersecting lines have no common arms.

$\angle 1$ and $\angle 3$

$\angle 4$ and $\angle 2$

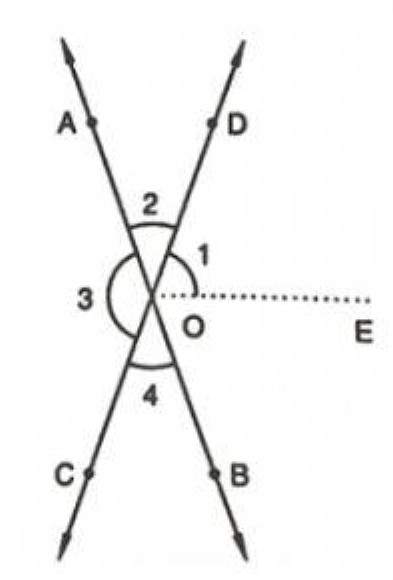
$\angle 5$ and $\angle 7$

$\angle 6$ and $\angle 8$

$\angle 9$ and $\angle 11$

$\angle 10$ and $\angle 12$

Q14. In Figure, OE is the bisector of $\angle BOD$. If $\angle 1 = 70^{\circ}$, Find the magnitude of $\angle 2, \angle 3, \angle 4$



Sol:

Given,

$\angle 1 = 70^{\circ}$

$\angle 3 = 2(\angle 1)$

$= 2(70^{\circ})$

$= 140^{\circ}$

$\angle 3 = \angle 4$

As, OE is the angle bisector,

$\angle DOB = 2(\angle 1)$

$= 2(70^{\circ})$

$= 140^{\circ}$

$\angle DOB + \angle AOC + \angle COB + \angle DOB = 360^\circ$

=> $140^\circ + 140^\circ$ + 2($\angle COB$) = 360°

Since, $\angle COB = \angle AOD$

=> 2($\angle COB$) = $360^\circ - 280^\circ$

=> 2($\angle COB$) = 80°

=> $\angle COB$ = $\frac{80^\circ}{2}$

=> $\angle COB$ = 40°

Therefore, $\angle COB = \angle AOB = 40^\circ$

The angles are,

$\angle 1 = 70^\circ$,

$\angle 2 = 40^\circ$,

$\angle 3 = 140^\circ$,

$\angle 4 = 40^\circ$

Q15. One of the angles forming a linear pair is a right angle. What can you say about its other angle?

Sol:

One of the Angle of a linear pair is the right angle (90°)

Therefore, the other angle is

=> $180^\circ - 90^\circ = 90^\circ$

Q16. One of the angles forming a linear pair is an obtuse angle. What kind of angle is the other?

Sol:

One of the Angles of a linear pair is obtuse, then the other angle should be acute, only then their sum will be 180°.

Q17. . One of the angles forming a linear pair is an acute angle. What kind of angle is the other?

Sol:

One of the Angles of a linear pair is acute, then the other angle should be obtuse, only then their sum will be 180°.

Q18. Can two acute angles form a linear pair?

Sol:

No, two acute angles cannot form a linear pair because their sum is always less than 180°.

Q19. If the supplement of an angle is 65°, then find its complement.

Sol:

Let x be the required angle

So,

=> x + 65° = 180°

=> x = $180^\circ - 65^\circ$

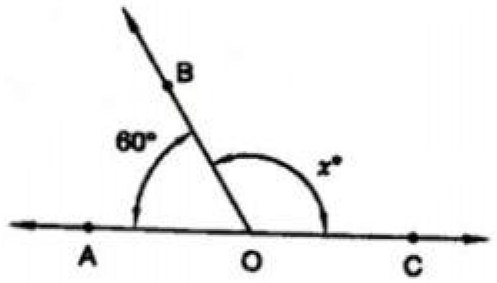
= 115°

But the complement of the angle cannot be determined.

Q20. Find the value of x in each of the following figures

Sol:

(i)



(I)

Since, $\angle BOA + \angle BOC = 180^\circ$

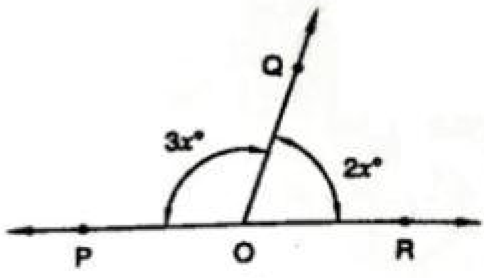
Linear pair :

=> $60^\circ + x^\circ = 180^\circ$

=> $x^\circ = 180^\circ - 60^\circ$

=> $x^\circ = 120^\circ$

(ii)



(ii)

Linear pair :

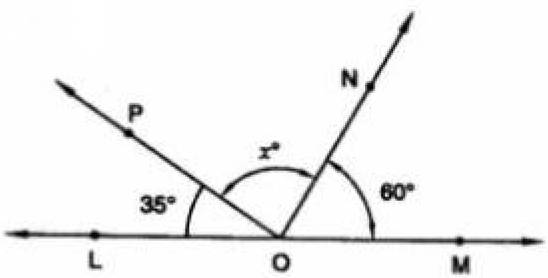
=> $3x^\circ + 2x^\circ = 180^\circ$

=> $5x^\circ = 180^\circ$

=> $x^\circ = \frac{180^\circ}{5}$

=> $x^\circ = 36^\circ$

(iii)



(iii)

Linear pair,

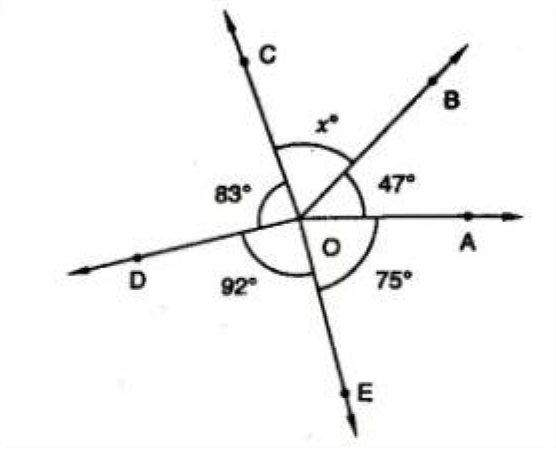
Since, $35^\circ + x^\circ + 60^\circ = 180^\circ$

=> $x^\circ = 180^\circ - 35^\circ - 60^\circ$

=> $x^\circ = 180^\circ - 95^\circ$

=> $x^\circ = 85^\circ$

(iv)



Linear pair,

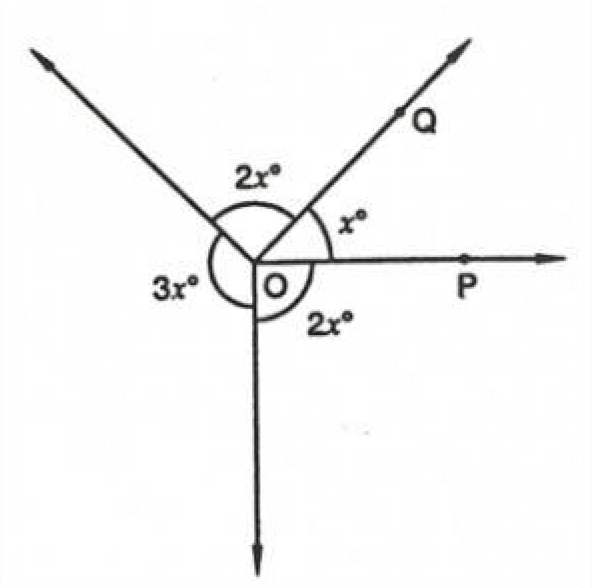
$83^\circ + 92^\circ + 47^\circ + 75^\circ + x^\circ = 360^\circ$

=> $x^\circ + 297^\circ = 360^\circ$

=> $x^\circ = 360^\circ - 297^\circ$

=> $x^\circ = 63^\circ$

(v)



Linear pair,

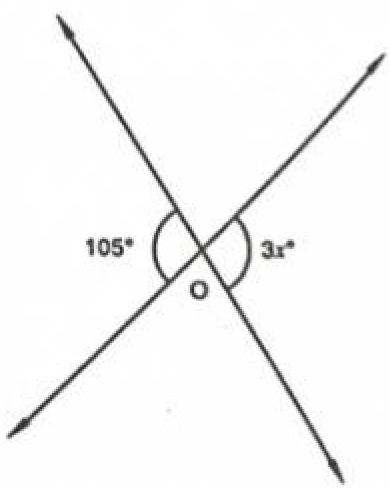
$3x^{\circ} + 2x^{\circ} + x^{\circ} + 2x^{\circ} = 360^{\circ}$

=> $8x^{\circ} = 360^{\circ}$

=> $x^{\circ} = \frac{360^{\circ}}{8}$

=> $x^{\circ} = 45^{\circ}$

(vi)



(vi)

Linear pair :

$3x^{\circ} = 105^{\circ}$

=> $x^{\circ} = \frac{105^{\circ}}{3}$

=> $x^{\circ} = 45^{\circ}$

Q21. In Fig. 22, it being given that $\angle 1 = 65^{\circ}$, find all the other angles.

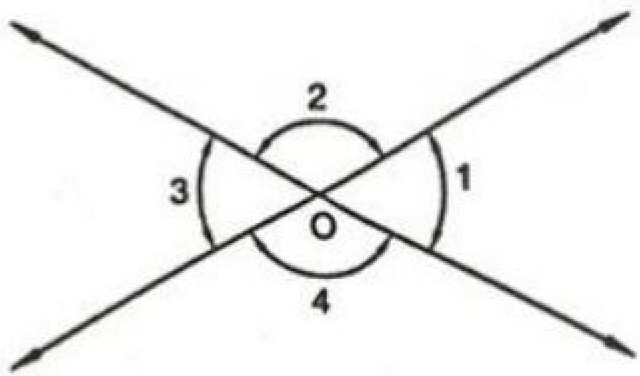


Fig. 22

Sol:

Given,

$\angle 1 = \angle 3$ are the vertically opposite angles

Therefore, $\angle 3 = 65^{\circ}$

Here, $\angle 1 + \angle 2 = 180^{\circ}$ are the linear pair

Therefore, $\angle 2 = 180^{\circ} - 65^{\circ}$

$= 115^{\circ}$

$\angle 2 = \angle 4$ are the vertically opposite angles

Therefore, $\angle 2 = \angle 4 = 115^{\circ}$

And $\angle 3 = 65^{\circ}$

Q22. In Fig. 23 OA and OB are the opposite rays :

(i) If x = 25°, what is the value of y?

(ii) If y = 35°, what is the value of x?

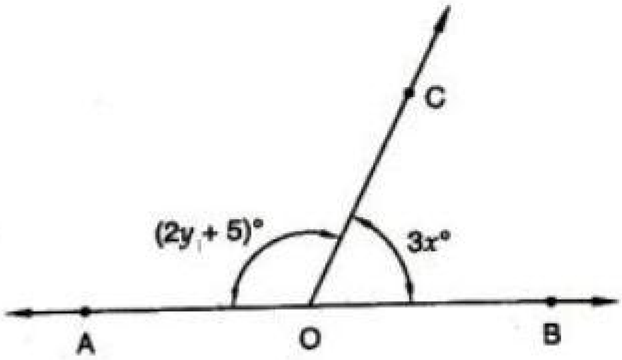


Fig. 23

Sol:

$\angle AOC + \angle BOC = 180^\circ$ – Linear pair

=> 2y + 5 + 3x = 180°

=> 3x + 2y = 175°

(i) If x = 25°, then

=> $3(25^\circ)$ + 2y = 175°

=> 75° + 2y = 175°

=> 2y = $175^\circ - 75^\circ$

=> 2y = 100°

=> y = $\frac{100^\circ}{2}$

=> y = 50°

(ii) If y = 35°, then

3x + $2(35^\circ)$ = 175°

=> 3x + 70° = 175°

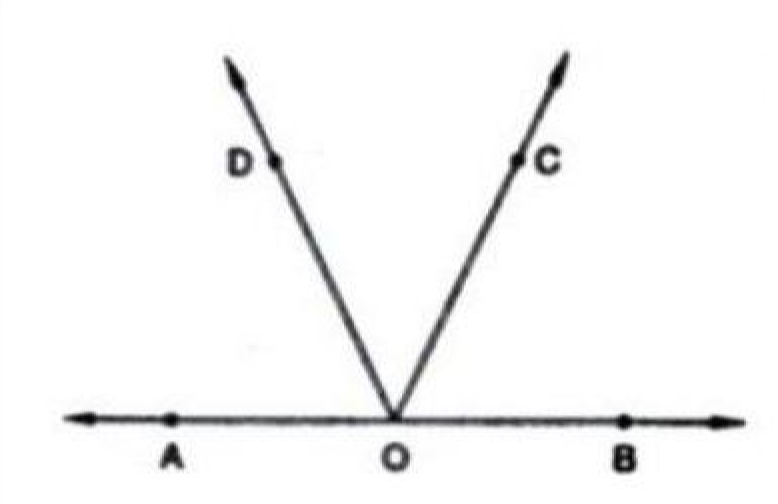
=> 3x = $175^\circ - 70^\circ$

=> 3x = 105°

=> x = $\frac{105^\circ}{3}$

=> x = 35°

Q23. In Fig. 24, write all pairs of adjacent angles and all the linear pairs.



Sol:

Pairs of adjacent angles are:

$\angle DOA$ and $\angle DOC$

$\angle BOC$ and $\angle COD$

$\angle AOD$ and $\angle BOD$

$\angle AOC$ and $\angle BOC$

Linear pairs:

$\angle AOD$ and $\angle BOD$

$\angle AOC$ and $\angle BOC$

Q24. In Fig. 25, find $\angle x$. Further find $\angle BOC, \angle COD, \angle AOD$.

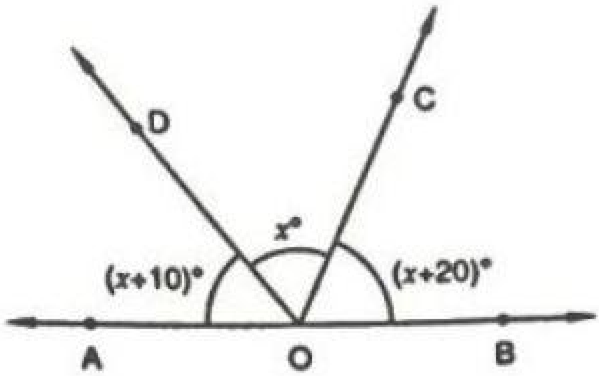


Fig. 25

Sol:

$(x+10)^\circ$ + x° + $(x+20)^\circ$ = 180°

=> $3x^\circ$ + 30° = 180°

=> $3x^\circ$ = $180^\circ - 30^\circ$

=> $3x^\circ$ = 150°

=> x° = $\frac{150^\circ}{3}$

=> x° = 50°

Here,

$\angle BOC$ = $(x+20)^\circ$

= $(50+20)^\circ$

= 70°

$\angle COD$ = 50°

$\angle AOD$ = $(x+10)^\circ$

= $(50+10)^\circ$

= 60°

Q25. How many pairs of adjacent angles are formed when two lines intersect in a point?

Sol:

If the two lines intersect at a point, then four adjacent pairs are formed and those are linear.

Q26. How many pairs of adjacent angles, in all, can you name in Figure?

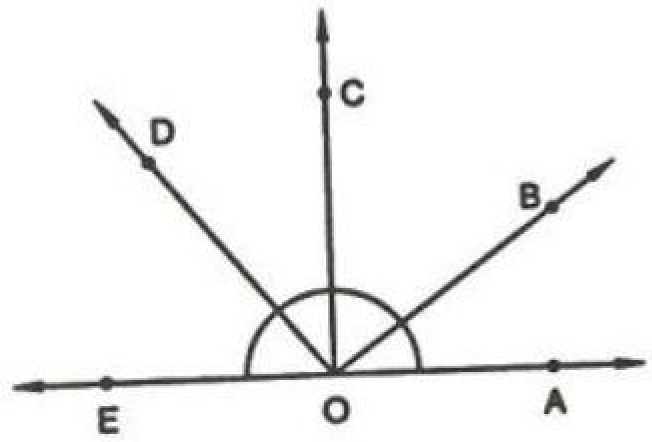


Fig. 26

Sol:

There are 10 adjacent pairs

$\angle EOD$ and $\angle DOC$

$\angle COD$ and $\angle BOC$

$\angle COB$ and $\angle BOA$

$\angle AOB$ and $\angle BOD$

$\angle BOC$ and $\angle COE$

$\angle COD$ and $\angle COA$

$\angle DOE$ and $\angle DOB$

$\angle EOD$ and $\angle DOA$

$\angle EOC$ and $\angle AOC$

$\angle AOB$ and $\angle BOE$

Q27. In Figure, determine the value of x.

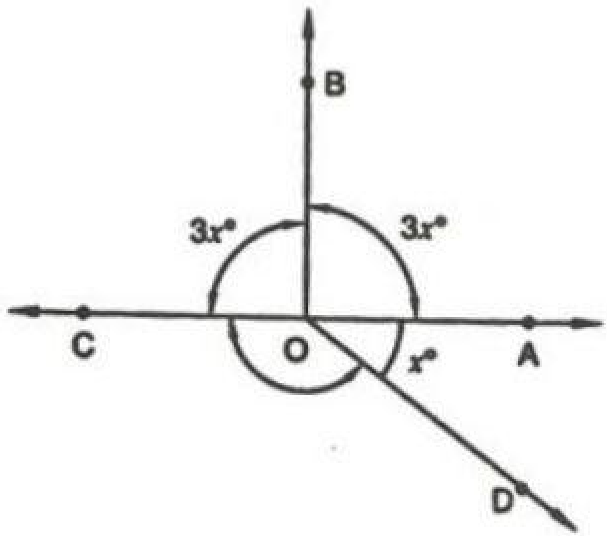


Fig. 27

Sol:

Linear pair :

$\angle COB + \angle AOB = 180^\circ$

=> $3x^\circ + 3x^\circ = 180^\circ$

=> $6x^\circ = 180^\circ$

=> $x^\circ = \frac{180^\circ}{6}$

=> $x^\circ = 30^\circ$

Q28. In Figure, AOC is a line, find x.

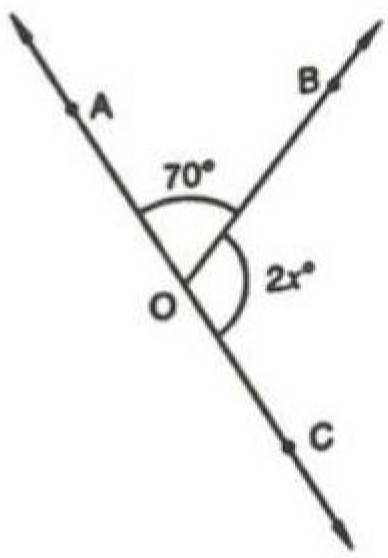


Fig. 28

Sol:

$\angle AOB + \angle BOC = 180^\circ$

Linear pair

=> $2x + 70^\circ = 180^\circ$

=> $2x = 180^\circ - 70^\circ$

=> $2x = 110^\circ$

=> $x = \frac{110^\circ}{2}$

=> $x = 55^\circ$

Q29. In Figure, POS is a line, find x.

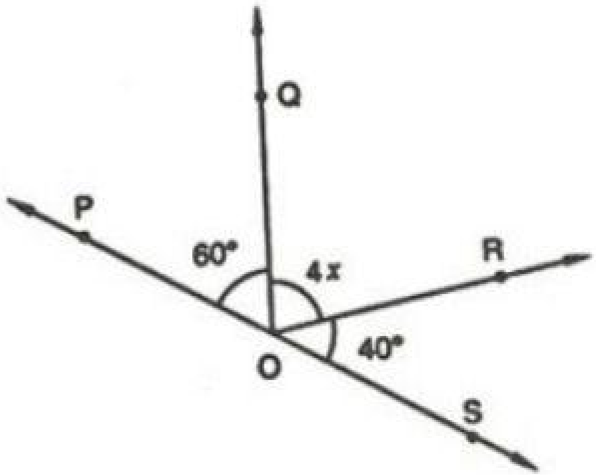


Fig. 29

Sol:

Angles of a straight line,

$\angle QOP + \angle QOR + \angle ROS = 108^\circ$

=> $60^\circ + 4x + 40^\circ = 180^\circ$

=> $100^\circ + 4x = 180^\circ$

=> $4x = 180^\circ - 100^\circ$

=> $4x = 80^\circ$

=> $x = \frac{80^\circ}{4}$

=> $x = 20^\circ$

Q30. In Figure, lines l_1 and l_2 intersect at O, forming angles as shown in the figure. If x = 45°, find the values of y, z and u.

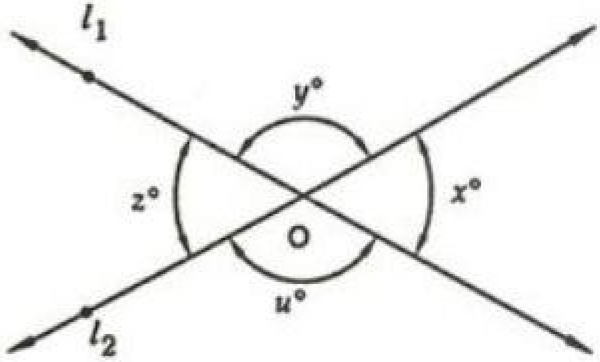


Fig. 30

Sol:

Given that,

$\angle x = 45^\circ$

$\angle x = \angle z = 45^\circ$

$\angle y = \angle u$

$\angle x + \angle y + \angle z + \angle u = 360^\circ$

=> $45^\circ + 45^\circ + \angle y + \angle u = 360^\circ$

=> $90^\circ + \angle y + \angle u = 360^\circ$

=> $\angle y + \angle u = 360^\circ - 90^\circ$

=> $\angle y + \angle u = 270^\circ$

=> $\angle y + \angle z = 270^\circ$

=> $2\angle z = 270^\circ$

=> $\angle z = 135^\circ$

Therefore, $\angle y = \angle u = 135^\circ$

So, $\angle x = 45^\circ$,

$\angle y = 135^\circ$,

$\angle z = 45^\circ$,

$\angle u = 135^\circ$

Q31. In Fig. 31, three coplanar lines lines intersect at a point O, forming angles as shown in the figure. Find the values of x,y,z and u

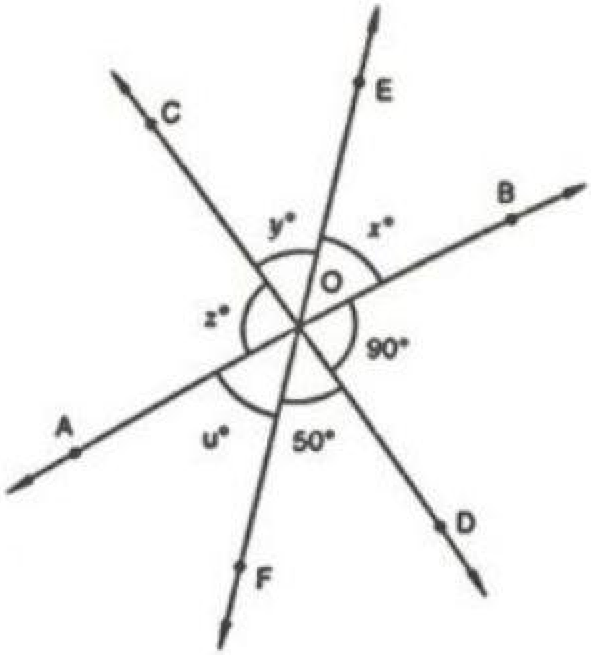


Fig. 31.

Sol:

Given that,

$\angle x + \angle y + \angle z + \angle u + 50° + 90° = 360°$

Linear pair,

$\angle x + 50° + 90° = 180°$

=> $\angle x + 140° = 180°$

=> $\angle x = 180° - 140°$

=> $\angle x = 40°$

$\angle x = \angle u = 40°$ are vertically opposite angles

=> $\angle z = 90°$ is a vertically opposite angle

=> $\angle y = 50°$ is a vertically opposite angle

Therefore, $\angle x = 40°$,

$\angle y = 50°$,

$\angle z = 90°$,

$\angle u = 40°$

Q32. In Figure, find the values of x, y and z

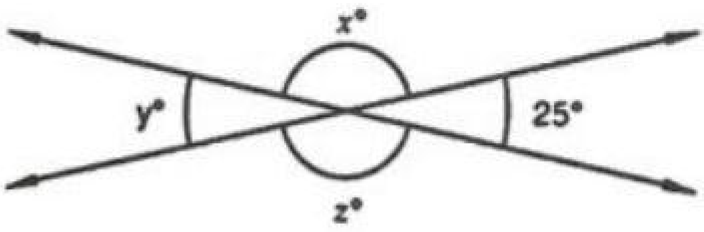


Fig. 32

Sol:

$\angle y = 25^\circ$ vertically opposite angle

$\angle x = \angle y$ are vertically opposite angles

$\angle x + \angle y + \angle z + 25^\circ = 360^\circ$

=> $\angle x + \angle z + 25^\circ + 25^\circ = 360^\circ$

=> $\angle x + \angle z + 50^\circ = 360^\circ$

=> $\angle x + \angle z = 360^\circ - 50^\circ$

=> $2\angle x = 310^\circ$

=> $\angle x = 155^\circ$

And , $\angle x = \angle z = 155^\circ$

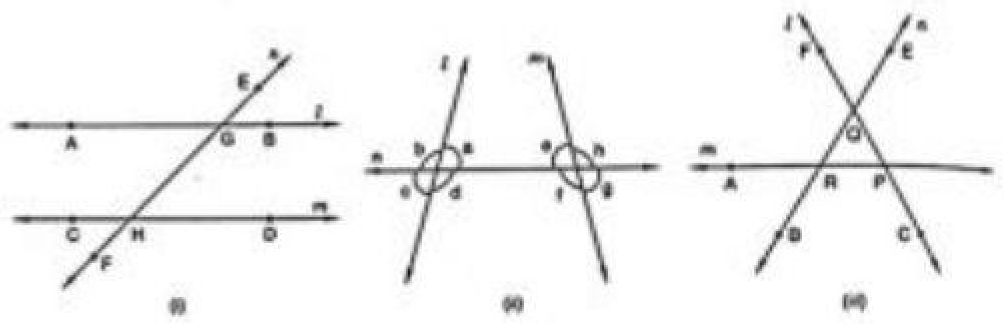
Therefore, $\angle x = 155^\circ$,

$\angle y = 25^\circ$,

$\angle z = 155^\circ$

Exercise 14.2

Q1. In Figure, line n is a transversal to line l and m. Identify the following:



(i) Alternate and corresponding angles in Fig. 58 (i)

(ii) Angles alternate to $\angle d$ and $\angle g$ and angles corresponding to $\angle RQF$ and angle alternate to $\angle PQE$ in Fig. 58 (ii)

(iii) Angle alternate to $\angle PQR$, angle corresponding to $\angle RQF$ and angle alternate to $\angle PQE$ in Fig. 58 (iii)

(iv) Pairs of interior and exterior angles on the same side of the transversal in Fig. 58 (iii)

Sol:

(i) Figure (i)

Corresponding angles :

$\angle EGB$ and $\angle GHD$

$\angle HGB$ and $\angle FHD$

$\angle EGA$ and $\angle GHC$

$\angle AGH$ and $\angle CHF$

The alternate angles are :

$\angle EGB$ and $\angle CHF$

$\angle HGB$ and $\angle CHG$

$\angle EGA$ and $\angle FHD$

$\angle AGH$ and $\angle GHD$

(ii) Figure (ii)

The alternate angle to $\angle d$ is $\angle e$.

The alternate angle to $\angle g$ is $\angle b$.

The corresponding angle to $\angle f$ is $\angle c$.

The corresponding angle to $\angle h$ is $\angle a$.

(iii) Figure (iii)

Angle alternate to $\angle PQR$ is $\angle QRA$.

Angle corresponding to $\angle RQF$ is $\angle ARB$.

Angle alternate to $\angle POE$ is $\angle ARB$.

(iv) Figure (ii)

Pair of interior angles are

$\angle a$ is $\angle e$.

$\angle d$ is $\angle f$.

Pair of exterior angles are

$\angle b$ is $\angle h$.

$\angle c$ is $\angle g$.

Q2. In Figure, AB and CD are parallel lines intersected by a transversal PQ at L and M respectively, If $\angle CMQ$ = 60°, find all other angles in the figure.

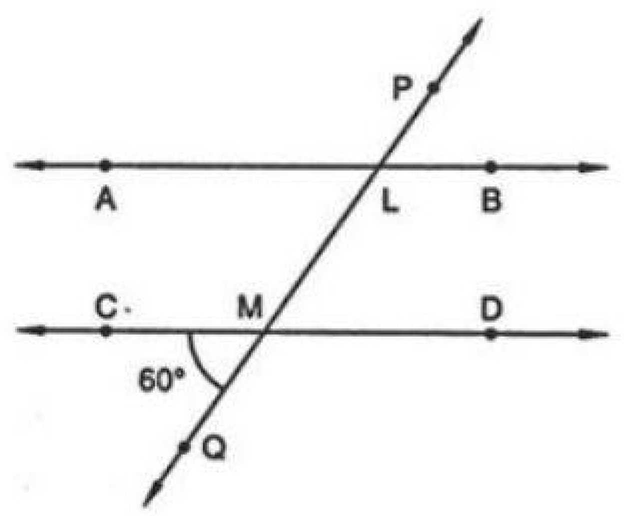


Fig. 59

Sol:

Corresponding angles :

$\angle ALM = \angle CMQ = 60^\circ$

Vertically opposite angles :

$\angle LMD = \angle CMQ = 60^\circ$

Vertically opposite angles :

$\angle ALM = \angle PLB = 60^\circ$

Here,

$\angle CMQ + \angle QMD = 180^\circ$ are the linear pair

=> $\angle QMD = 180^\circ - 60^\circ$

$= 120^\circ$

Corresponding angles :

$\angle QMD = \angle MLB = 120^\circ$

Vertically opposite angles

$\angle QMD = \angle CML = 120^\circ$

Vertically opposite angles

$\angle MLB = \angle ALP = 120^\circ$

Q3. In Fig. 60, AB and CD are parallel lines intersected by a transversal by a transversal PQ at L and M respectively. If $\angle LMD = 35^\circ$ find $\angle ALM$ and $\angle PLA$.

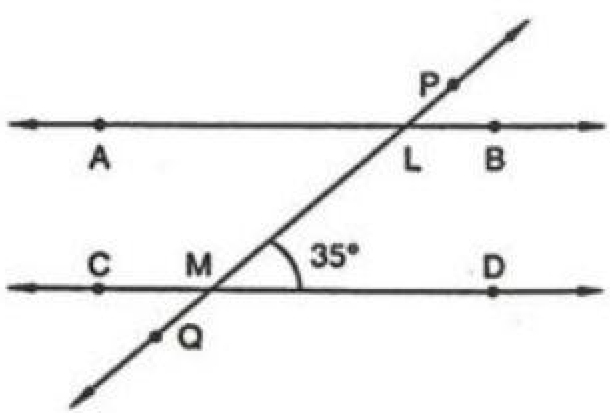


Fig. 60

Sol:

Given that,

$\angle LMD$ = 35°

$\angle LMD$ and $\angle LMC$ is a linear pair

$\angle LMD + \angle LMC = 180^\circ$

=> $\angle LMC = 180^\circ - 35^\circ$

= 145°

So, $\angle LMC = \angle PLA = 145^\circ$

And, $\angle LMC = \angle MLB = 145^\circ$

$\angle MLB$ and $\angle ALM$ is a linear pair

$\angle MLB + \angle ALM = 180^\circ$

=> $\angle ALM = 180^\circ - 145^\circ$

=> $\angle ALM = 35^\circ$

Therefore, $\angle ALM = 35^\circ$, $\angle PLA = 145^\circ$.

Q4. The line n is transversal to line l and m in Fig. 61. Identify the angle alternate to $\angle 13$, angle corresponding to $\angle 15$, and angle alternate to $\angle 15$.

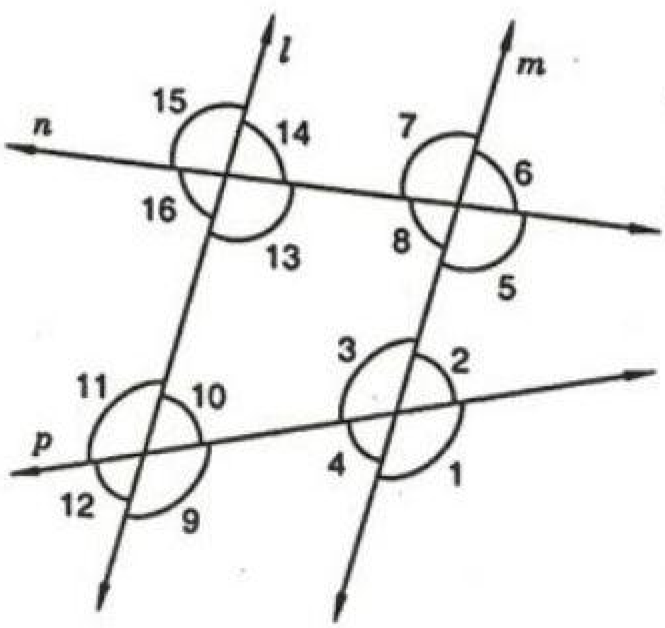


Fig. 61

Sol:

Given that, l || m

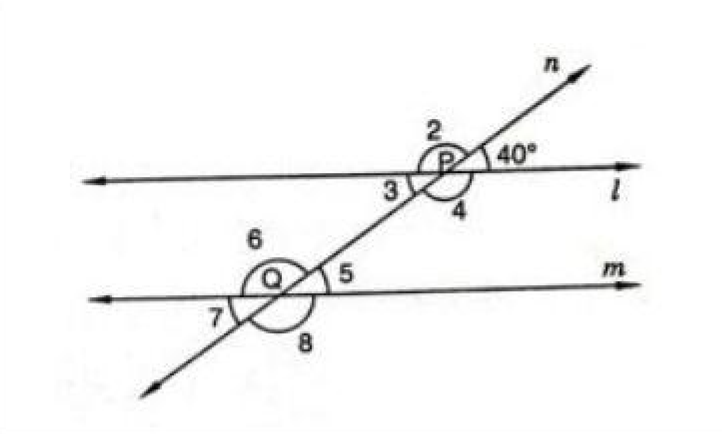
So,

The angle alternate to $\angle 13$ is $\angle 7$

The angle corresponding to $\angle 15$ is $\angle 7$

The angle alternate to $\angle 15$ is $\angle 5$

Q5. In Fig. 62, line l || m and n is transversal. If $\angle 1 = 40^\circ$, find all the angles and check that all corresponding angles and alternate angles are equal.



Sol:

Given that,

$\angle 1 = 40^\circ$

$\angle 1$ and $\angle 2$ is a linear pair

=> $\angle 1 + \angle 2 = 180^\circ$

=> $\angle 2 = 180^\circ - 40^\circ$

=> $\angle 2 = 140^\circ$

$\angle 2$ and $\angle 6$ is a corresponding angle pair

So, $\angle 6 = 140^\circ$

$\angle 6$ and $\angle 5$ is a linear pair

=> $\angle 6 + \angle 5 = 180^\circ$

=> $\angle 5 = 180^\circ - 140^\circ$

=> $\angle 5 = 40^\circ$

$\angle 3$ and $\angle 5$ are alternative interior angles

So, $\angle 5 = \angle 3 = 40^\circ$

$\angle 3$ and $\angle 4$ is a linear pair

=> $\angle 3 + \angle 4 = 180^\circ$

=> $\angle 4 = 180^\circ - 40^\circ$

=> $\angle 4 = 140^\circ$

$\angle 4$ and $\angle 6$ are a pair interior angles

So, $\angle 4 = \angle 6 = 140^\circ$

$\angle 3$ and $\angle 7$ are pair of corresponding angles

So, $\angle 3 = \angle 7 = 40^\circ$

Therefore, $\angle 7 = 40^\circ$

$\angle 4$ and $\angle 8$ are a pair corresponding angles

So, $\angle 4 = \angle 8 = 140^\circ$

Therefore, $\angle 8 = 140^\circ$

So, $\angle 1 = 40^\circ$, $\angle 2 = 140^\circ$, $\angle 3 = 40^\circ$, $\angle 4 = 140^\circ$, $\angle 5 = 40^\circ$, $\angle 6 = 140^\circ$, $\angle 7 = 40^\circ$, $\angle 8 = 140^\circ$

Q6. In Fig. 63, line l || m and a transversal n cuts them P and Q respectively. If $\angle 1 = 75^\circ$, find all other angles.

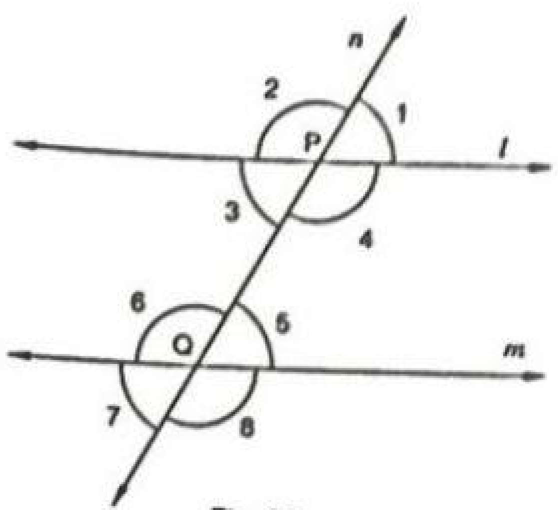


Fig. 63

Sol:

Given that, l || m and $\angle 1 = 75^\circ$

We know that,

$\angle 1 + \angle 2 = 180^\circ$ —- (linear pair)

=> $\angle 2 = 180^\circ - 75^\circ$

=> $\angle 2 = 105^\circ$

here, $\angle 1 = \angle 5 = 75^\circ$ are corresponding angles

$\angle 5 = \angle 7 = 75^\circ$ are vertically opposite angles.

$\angle 2 = \angle 6 = 105^\circ$ are corresponding angles

$\angle 6 = \angle 8 = 105^\circ$ are vertically opposite angles

$\angle 2 = \angle 4 = 105^\circ$ are vertically opposite angles

So, $\angle 1 = 75^\circ$, $\angle 2 = 105^\circ$, $\angle 3 = 75^\circ$, $\angle 4 = 105^\circ$, $\angle 5 = 75^\circ$, $\angle 6 = 105^\circ$, $\angle 7 = 75^\circ$, $\angle 8 = 105^\circ$

Q7. In Fig. 64, AB || CD and a transversal PQ cuts at L and M respectively. If $\angle QMD = 100^\circ$, find all the other angles.

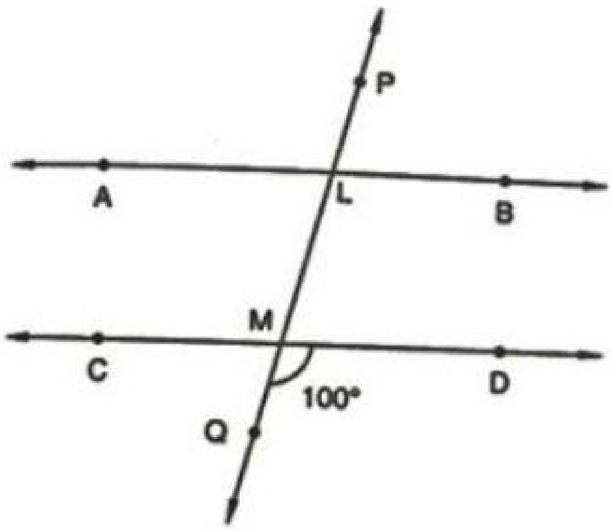


Fig. 64

Sol:

Given that, AB || CD and $\angle QMD = 100^\circ$

We know that,

Linear pair,

$\angle QMD + \angle QMC = 180^\circ$

=> $\angle QMC = 180^\circ - \angle QMD$

=> $\angle QMC = 180^\circ - 100^\circ$

=> $\angle QMC = 80^\circ$

Corresponding angles,

$\angle DMQ = \angle BLM = 100^\circ$

$\angle CMQ = \angle ALM = 80^\circ$

Vertically Opposite angles,

$\angle DMQ = \angle CML = 100^\circ$

$\angle BLM = \angle PLA = 100^\circ$

$\angle CMQ = \angle DML = 80^\circ$

$\angle ALM = \angle PLB = 80^\circ$

Q8. In Fig. 65, l || m and p || q. Find the values of x,y,z,t.

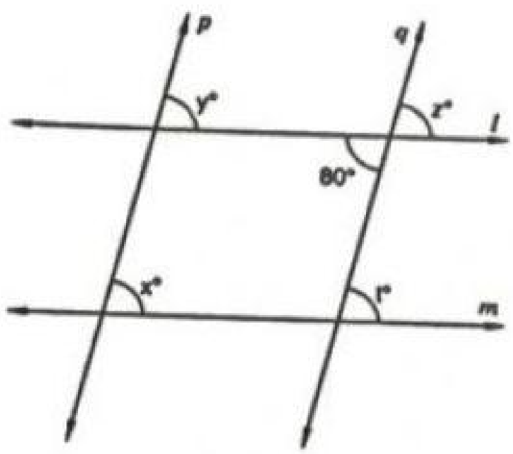


Fig. 65

Sol:

Give that , angle is 80°

$\angle z$ and 80° are vertically opposite angles

=> $\angle z = 80^\circ$

$\angle z$ and $\angle t$ are corresponding angles

=> $\angle z = \angle t$

Therefore, $\angle t = 80^\circ$

$\angle z$ and $\angle y$ are corresponding angles

=> $\angle z = \angle y$

Therefore, $\angle y = 80^\circ$

$\angle x$ and $\angle y$ are corresponding angles

=> $\angle y = \angle x$

Therefore, $\angle x = 80^\circ$

Q9. In Fig. 66, line l || m, $\angle 1 = 120^\circ$ and $\angle 2 = 100^\circ$, find out $\angle 3$ and $\angle 4$.

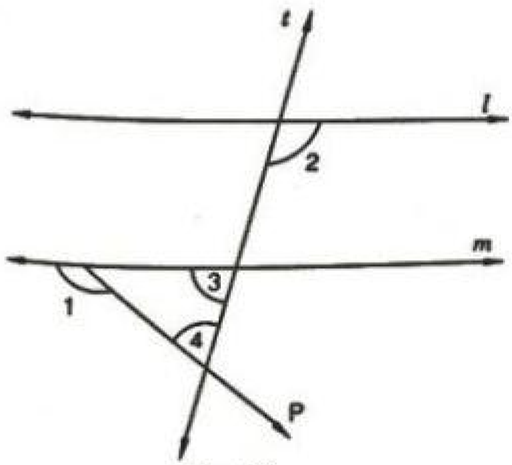


Fig. 66

Sol:

Given that, $\angle 1 = 120^\circ$ and $\angle 2 = 100^\circ$

$\angle 1$ and $\angle 5$ a linear pair

=> $\angle 1 + \angle 5 = 180^\circ$

=> $\angle 5 = 180^\circ - 120^\circ$

=> $\angle 5 = 60^\circ$

Therefore, $\angle 5 = 60^\circ$

$\angle 2$ and $\angle 6$ are corresponding angles

=> $\angle 2 = \angle 6 = 100^\circ$

Therefore, $\angle 6 = 100^\circ$

$\angle 6$ and $\angle 3$ a linear pair

=> $\angle 6 + \angle 3 = 180^\circ$

=> $\angle 3 = 180^\circ - 100^\circ$

=> $\angle 3 = 80^\circ$

Therefore, $\angle 3 = 80^\circ$

By, angles of sum property

=> $\angle 3 + \angle 5 + \angle 4 = 180^\circ$

=> $\angle 4 = 180^\circ - 80^\circ - 60^\circ$

=> $\angle 4 = 40^\circ$

Therefore, $\angle 4 = 40^\circ$

Q10. In Fig. 67, l || m. Find the values of a,b,c,d. Give reasons.

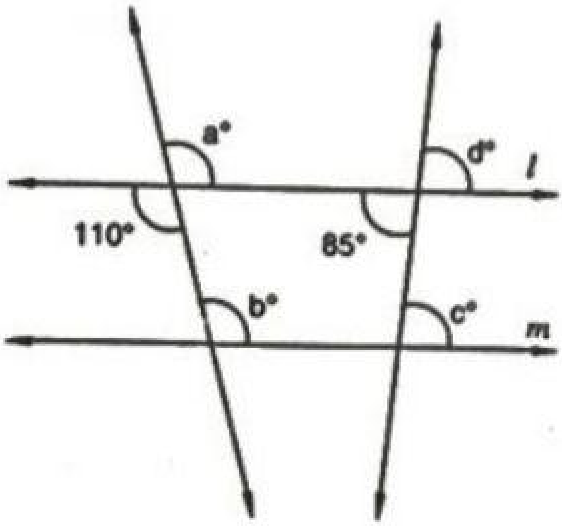


Fig. 67

Sol:

Given that, l || m

Vertically opposite angles,

$\angle a = 110^\circ$

Corresponding angles,

$\angle a = \angle b$

Therefore, $\angle b = 110^\circ$

Vertically opposite angle,

$\angle d = 85^\circ$

Corresponding angles,

$\angle d = \angle c$

Therefore, $\angle c = 85^\circ$

Hence, $\angle a = 110^\circ$, $\angle b = 110^\circ$, $\angle c = 85^\circ$, $\angle d = 85^\circ$

Q11. In Fig. 68, AB || CD and $\angle 1$ and $\angle 2$ are in the ratio of 3 : 2. Determine all angles from 1 to 8.

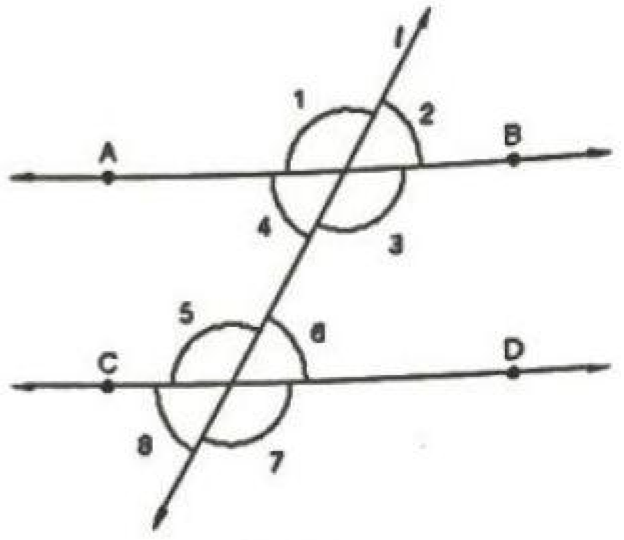


Fig. 68

Sol:

Given that,

$\angle 1$ and $\angle 2$ are 3 : 2

Let us take the angles as 3x, 2x

$\angle 1$ and $\angle 2$ are linear pair

=> 3x + 2x = 180°

=> 5x = 180°

=> x = $\frac{180^\circ}{5}$

=> x = 36°

Therefore, $\angle 1$ = 3x = 3(36) = 108°

$\angle 2$ = 2x = 2(36) = 72°

$\angle 1$ and $\angle 5$ are corresponding angles

=> $\angle 1$ = $\angle 5$

Therefore, $\angle 5$ = 108°

$\angle 2$ and $\angle 6$ are corresponding angles

=> $\angle 2$ = $\angle 6$

Therefore, $\angle 6$ = 72°

$\angle 4$ and $\angle 6$ are alternate pair of angles

=> $\angle 4$ = $\angle 6$ = 72°

Therefore, $\angle 4 = 72^\circ$

$\angle 3$ and $\angle 5$ are alternate pair of angles

=> $\angle 3 = \angle 5 = 108^\circ$

Therefore, $\angle 5 = 108^\circ$

$\angle 2$ and $\angle 8$ are alternate exterior of angles

=> $\angle 2 = \angle 8 = 72^\circ$

Therefore, $\angle 8 = 72^\circ$

$\angle 1$ and $\angle 7$ are alternate exterior of angles

=> $\angle 1 = \angle 7 = 108^\circ$

Therefore, $\angle 7 = 108^\circ$

Hence, $\angle 1 = 108^\circ$, $\angle 2 = 72^\circ$, $\angle 3 = 108^\circ$, $\angle 4 = 72^\circ$, $\angle 5 = 108^\circ$, $\angle 6 = 72^\circ$, $\angle 7 = 108^\circ$, $\angle 8 = 72^\circ$

Q12. In Fig. 69 l, m and n are parallel lines intersected by transversal p at X, Y and Z respectively. Find $\angle 1$, $\angle 2$ and $\angle 3$.

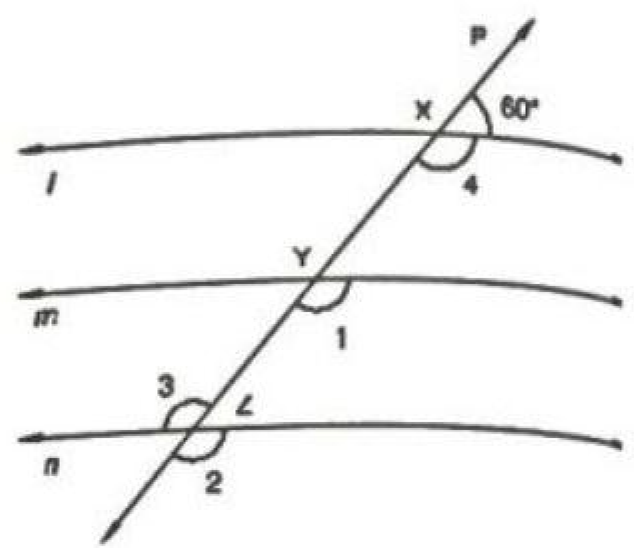


Fig. 69

Sol:

Linear pair,

=> $\angle 4 + 60^\circ = 180^\circ$

=> $\angle 4 = 180^\circ - 60^\circ$

=> $\angle 4 = 120^\circ$

$\angle 4$ and $\angle 1$ are corresponding angles

=> $\angle 4$ = $\angle 1$

Therefore, $\angle 1$ = 120°

$\angle 1$ and $\angle 2$ are corresponding angles

=> $\angle 2$ = $\angle 1$

Therefore, $\angle 2$ = 120°

$\angle 2$ and $\angle 3$ are vertically opposite angles

=> $\angle 2$ = $\angle 3$

Therefore, $\angle 3$ = 120°

Q13. In Fig. 70, if l || m || n and $\angle 1$ = 60°, find $\angle 2$

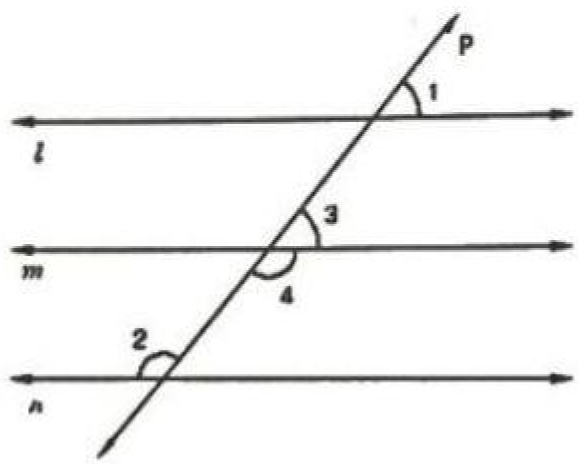


Fig. 70

Sol:

Given that,

Corresponding angles :

$\angle 1$ = $\angle 3$

=> $\angle 1$ = 60°

Therefore, $\angle 3$ = 60°

$\angle 3$ and $\angle 4$ are linear pair

=> $\angle 3$ + $\angle 4$ = 180°

=> $\angle 4 = 180^\circ - 60^\circ$

=> $\angle 4 = 120^\circ$

$\angle 3$ and $\angle 4$ are alternative interior angles

=> $\angle 4 = \angle 2$

Therefore, $\angle 2 = 120^\circ$

Q14. In Fig. 71, if AB || CD and CD|| EF, find $\angle ACE$.

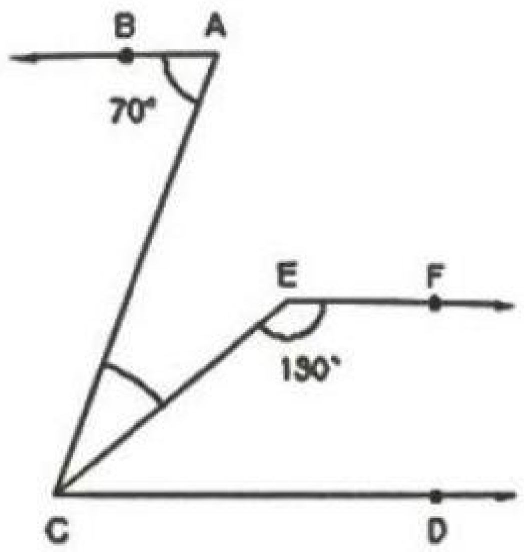


Fig. 71

Sol :

Given that,

Sum of the interior angles,

=> $\angle CEF + \angle ECD = 180^\circ$

=> $130^\circ + \angle ECD = 180^\circ$

=> $\angle ECD = 180^\circ - 130^\circ$

=> $\angle ECD = 50^\circ$

We know that alternate angles are equal

=> $\angle BAC = \angle ACD$

=> $\angle BAC = \angle ECD + \angle ACE$

=> $\angle ACE = 70^\circ - 50^\circ$

=> $\angle ACE = 20^\circ$

Therefore, $\angle ACE = 20^\circ$

Q15. In Fig. 72, if l || m, n || p and $\angle 1 = 85^\circ$, find $\angle 2$.

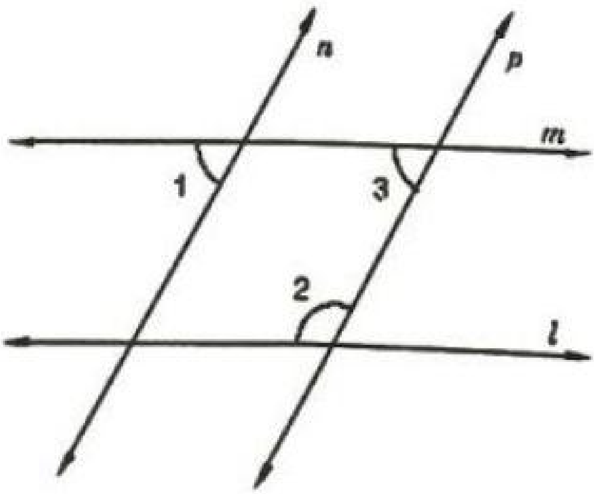


Fig. 72

Sol:

Given that, $\angle 1 = 85^\circ$

$\angle 1$ and $\angle 3$ are corresponding angles

So, $\angle 1 = \angle 3$

=> $\angle 3 = 85^\circ$

Sum of the interior angles

=> $\angle 3 + \angle 2 = 180^\circ$

=> $\angle 2 = 180^\circ - 85^\circ$

=> $\angle 2 = 95^\circ$

Q16. In Fig. 73, a transversal n cuts two lines l and m. If $\angle 1 = 70^\circ$ and $\angle 7 = 80^\circ$, is l || m?

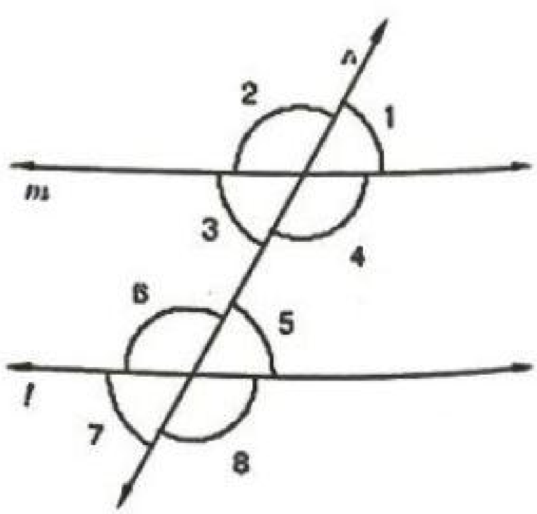


Fig. 73

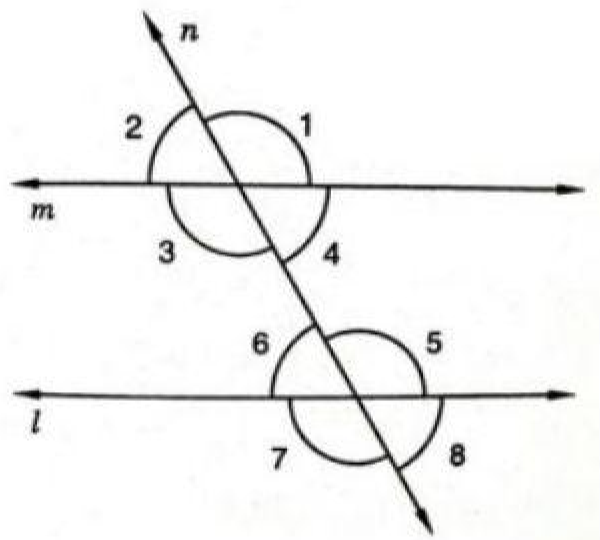
Sol:

We know that if the alternate exterior angles of the two lines are equal, then the lines are parallel.

Here, $\angle 1$ and $\angle 7$ are alternate exterior angles , but they are not equal

=> $\angle 1 \neq \angle 7 \neq 80^\circ$

Q17. In Fig. 74, a transversal n cuts two lines l and m such that $\angle 2$ = 65° and $\angle 8$ = 65°. Are the lines parallel?



Sol:

vertically opposite angels,

$\angle 2$ = $\angle 3$ = 65°

$\angle 8$ = $\angle 6$ = 65°

Therefore, $\angle 3$ = $\angle 6$

Hence , l || m

Q18. In Fig. 75, Show that AB || EF.

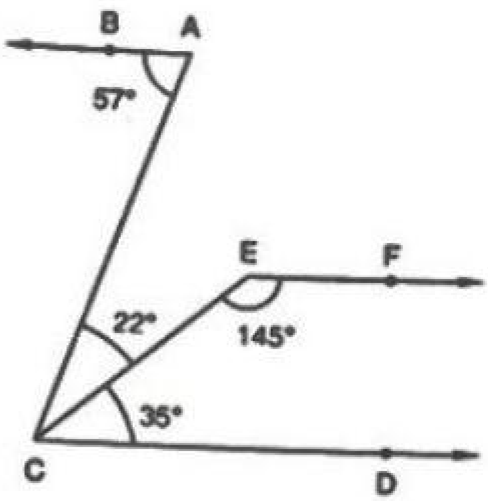


Fig. 75

Sol:

We know that,

$\angle ACD = \angle ACE + \angle ECD$

=> $\angle ACD = 35^\circ + 22^\circ$

=> $\angle ACD = 57^\circ = \angle BAC$

Thus, lines BA and CD are intersected by the line AC such that, $\angle ACD = \angle BAC$

So, the alternate angles are equal

Therefore, AB || CD ——— 1

Now,

$\angle ECD + \angle CEF = 35^\circ + 45^\circ = 180^\circ$

This, shows that sum of the angles of the interior angles on the same side of the transversal CE is 180 degrees

So, they are supplementary angles

Therefore, EF || CD ————- 2

From eq 1 and 2

We can say that, AB || EF

Q19. In Fig. 76, AB || CD. Find the values of x,y,z.

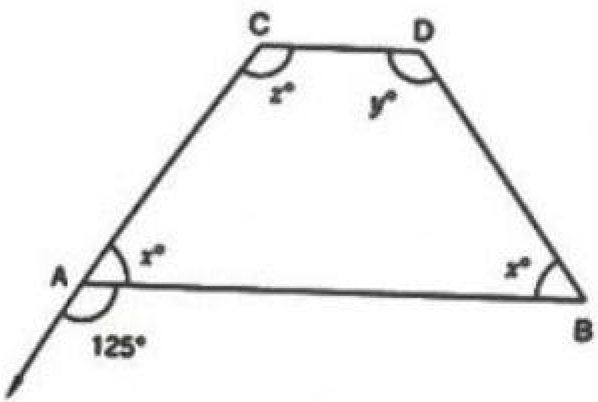


Fig. 76

Sol:

Linear pair,

=> $\angle x + 125^\circ = 180^\circ$

=> $\angle x = 180^\circ - 125^\circ$

=> $\angle x = 55^\circ$

Corresponding angles

=> $\angle z = 125^\circ$

Adjacent interior angles

=> $\angle x + \angle z = 180^\circ$

=> $\angle x + 125^\circ = 180^\circ$

=> $\angle x = 180^\circ - 125^\circ$

=> $\angle x = 55^\circ$

Adjacent interior angles

=> $\angle x + \angle y = 180^\circ$

=> $\angle y + 55^\circ = 180^\circ$

=> $\angle y = 180^\circ - 55^\circ$

=> $\angle y = 125^\circ$

Q20. In Fig. 77, find out $\angle PXR$, if PQ || RS.

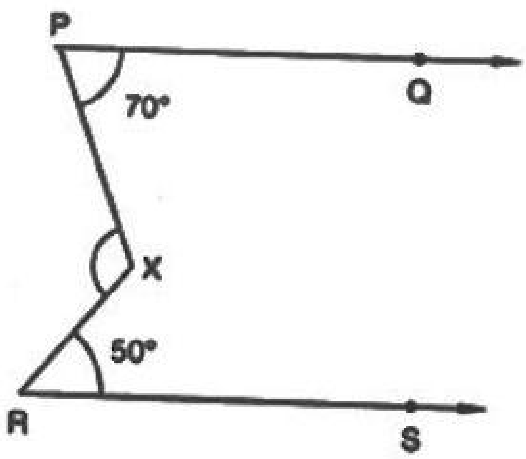


Fig. 77

Sol:

We need to find $\angle PXR$

$\angle XRS = 50^\circ$

$\angle XPR = 70^\circ$

Given, that PQ || RS

$\angle PXR = \angle XRS + \angle XPR$

$\angle PXR = 50^\circ + 70^\circ$

$\angle PXR = 120^\circ$

Therefore, $\angle PXR = 120^\circ$

Q21. In Fig. 78, we have

(i) $\angle MLY = 2\angle LMQ$

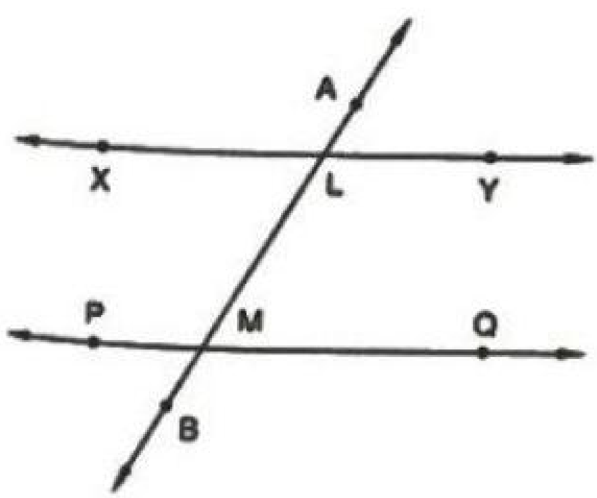


Fig. 78

Sol:

$\angle MLY$ and $\angle LMQ$ are interior angles

=> $\angle MLY$ + $\angle LMQ$ = 180°

=> 2$\angle LMQ$ + $\angle LMQ$ = 180°

=> 3$\angle LMQ$ = 180°

=> $\angle LMQ$ = $\frac{180^\circ}{3}$

=> $\angle LMQ$ = 60°

(ii) $\angle XLM$ = $(2x-10)^\circ$ and $\angle LMQ$ = $(x+30)^\circ$, find x.

Sol:

$\angle XLM$ = $(2x-10)^\circ$ and $\angle LMQ$ = $(x+30)^\circ$

$\angle XLM$ and $\angle LMQ$ are alternate interior angles

=> $\angle XLM$ = $\angle LMQ$

=> $(2x-10)^\circ$ = $(x+30)^\circ$

=> 2x − x = 30° + 10°

=> x = 40°

Therefore, x = 40°

(iii) $\angle XLM$ = $\angle PML$, find $\angle ALY$

Sol:

$\angle XLM$ = $\angle PML$

Sum of interior angles is 180 degrees

=> $\angle XLM$ + $\angle PML$ = 180°

=> $\angle XLM$ + $\angle XLM$ = 180°

=> 2$\angle XLM$ = 180°

=> $\angle XLM$ = $\frac{180^\circ}{2}$

=> $\angle XLM$ = 90°

$\angle XLM$ and $\angle ALY$ are vertically opposite angles

Therefore, $\angle ALY$ = 90°

(iv) $\angle ALY$ = $(2x - 15)^{\circ}$, $\angle LMQ$ = $(x + 40)^{\circ}$, find x.

Sol:

$\angle ALY$ and $\angle LMQ$ are corresponding angles

=> $\angle ALY$ = $\angle LMQ$

=> $(2x - 15)^{\circ}$ = $(x + 40)^{\circ}$

=> 2x − x = 40° + 15°

=> x = 55°

Therefore, x = 55°

Q22. In Fig. 79, DE || BC. Find the values of x and y.

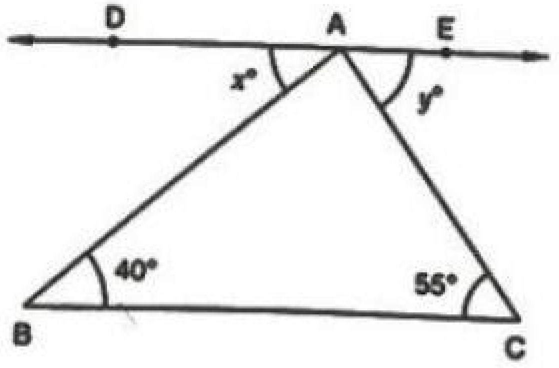


Fig. 79

Sol:

We know that, ABC, DAB are alternate interior angles

$\angle ABC$ = $\angle DAB$

So, x = 40°

And ACB, EAC are alternate interior angles

$\angle ACB$ = $\angle EAC$

So, y = 40°

Q23. In Fig. 80, line AC || line DE and $\angle ABD = 32^\circ$, Find out the angles x and y if $\angle E = 122^\circ$.

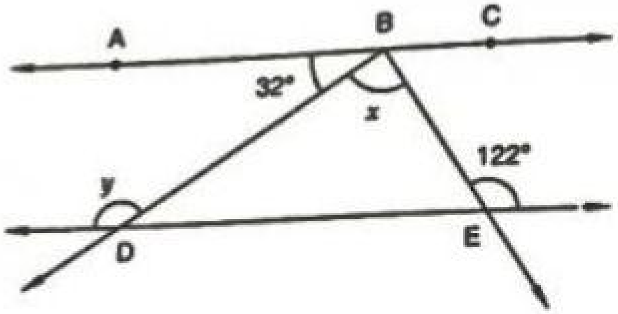


Fig. 80

Sol:

$\angle BDE = \angle ABD = 32^\circ$ – alternate interior angles

=> $\angle BDE + y = 180^\circ$ – linear pair

=> $32^\circ + y = 180^\circ$

=> $y = 180^\circ - 32^\circ$

=> $y = 148^\circ$

$\angle ABE = \angle E = 32^\circ$ – alternate interior angles

=> $\angle ABD + \angle DBE = 122^\circ$

=> $32^\circ + x = 122^\circ$

=> $x = 122^\circ - 32^\circ$

=> $x = 90^\circ$

Q24. In Fig. 81, side BC of ΔABC has been produced to D and CE || BA. If $\angle ABC = 65^\circ$, $\angle BAC = 55^\circ$, find $\angle ACE, \angle ECD, \angle ACD.$

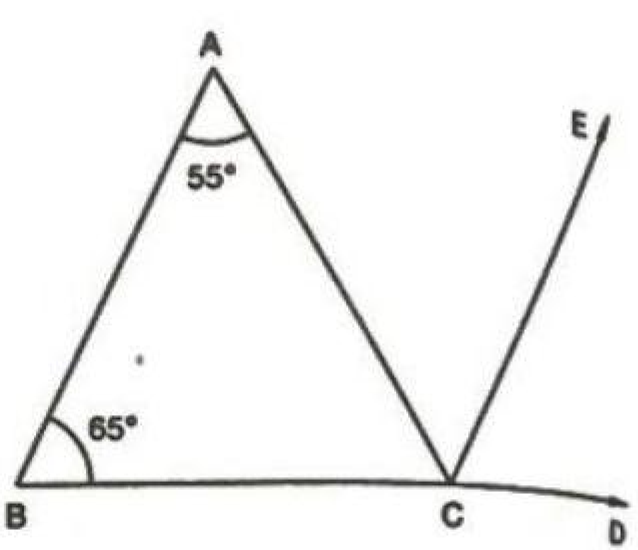


Fig. 81

Sol:

Corresponding angles,

$\angle ABC = \angle ECD = 55^\circ$

Alternate interior angles,

$\angle BAC = \angle ACE = 65^\circ$

Now, $\angle ACD = \angle ACE + \angle ECD$

=> $\angle ACD = 55^\circ + 65^\circ$

= 120°

Q25. In Fig. 82, line CA ⊥ AB || line CR and line PR || line BD. Find $\angle x, \angle y, \angle z$.

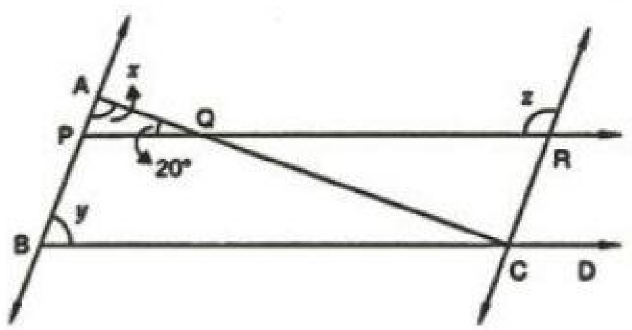


Fig. 82

Sol:

Given that, CA ⊥ AB

=> $\angle CAB = 90^\circ$

=> $\angle AQP = 20^\circ$

By, angle of sum property

In ΔAPD

=> $\angle CAB + \angle AQP + \angle APQ = 180^\circ$

=> $\angle APQ = 180^\circ - 90^\circ - 20^\circ$

=> $\angle APQ = 70^\circ$

y and $\angle APQ$ are corresponding angles

=> y = $\angle APQ = 70^\circ$

$\angle APQ$ and $\angle z$ are interior angles

=> $\angle APQ + \angle z = 180^\circ$

=> $\angle z = 180^\circ - 70^\circ$

=> $\angle z = 110^\circ$

Q26. In Fig. 83, PQ || RS. Find the value of x.

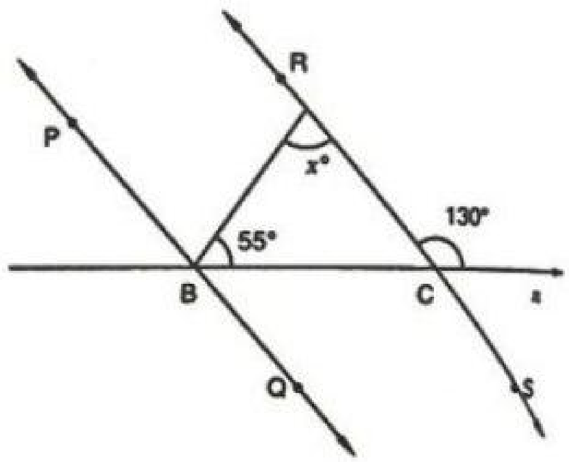


Fig. 83

Sol:

Given,

Linear pair,

$\angle RCD + \angle RCB = 180^\circ$

=> $\angle RCB = 180^\circ - 130^\circ$

= 50°

In ΔABC,

$\angle BAC + \angle ABC + \angle BCA = 180^\circ$

By, angle sum property

=> $\angle BAC = 180^\circ - 55^\circ - 50^\circ$

=> $\angle BAC = 75^\circ$

Q27. In Fig. 84, AB || CD and AE || CF, $\angle FCG = 90^\circ$ and $\angle BAC = 120^\circ$. Find the value of x, y and z.

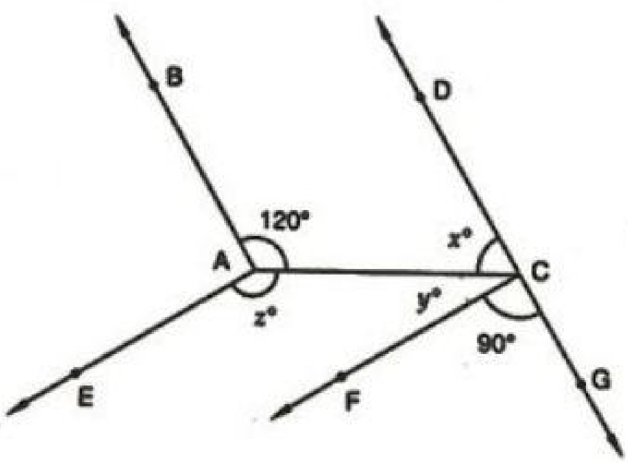


Fig. 84

Sol:

Alternate interior angle

$\angle BAC = \angle ACG = 120^\circ$

=> $\angle ACF + \angle FCG = 120^\circ$

So, $\angle ACF = 120^\circ - 90^\circ$

$= 30^\circ$

Linear pair,

$\angle DCA + \angle ACG = 180^\circ$

=> $\angle x = 180^\circ - 120^\circ$

$= 60^\circ$

$\angle BAC + \angle BAE + \angle EAC = 360^\circ$

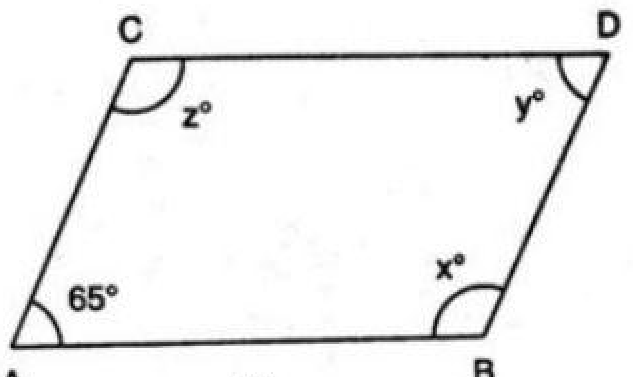
$\angle CAE = 360^\circ - 120^\circ - (60^\circ + 30^\circ)$

$= 150^\circ$

Q28. In Fig. 85, AB || CD and AC || BD. Find the values of x,y,z.

Sol:

(i)



(i)

Since, AC || BD and CD || AB, ABCD is a parallelogram

Adjacent angles of parallelogram,

$\angle CAD + \angle ACD = 180^\circ$

=> $\angle ACD = 180^\circ - 65^\circ$

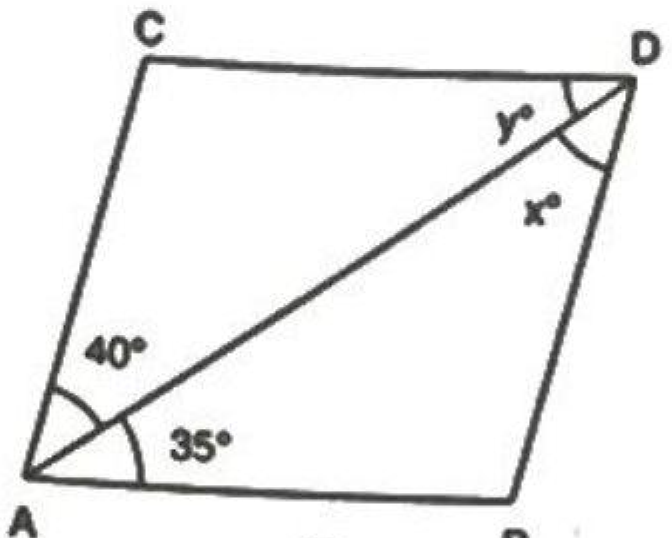
$= 115^\circ$

Opposite angles of parallelogram,

=> $\angle CAD = \angle CDB = 65^\circ$

=> $\angle ACD = \angle DBA = 115^\circ$

(ii)



(ii)

here,

AC || BD and CD || AB

Alternate interior angles,

$\angle DCA$ = x = 40°

$\angle DAB$ = y = 35°

Q29. In Fig. 86, state which lines are parallel and why?

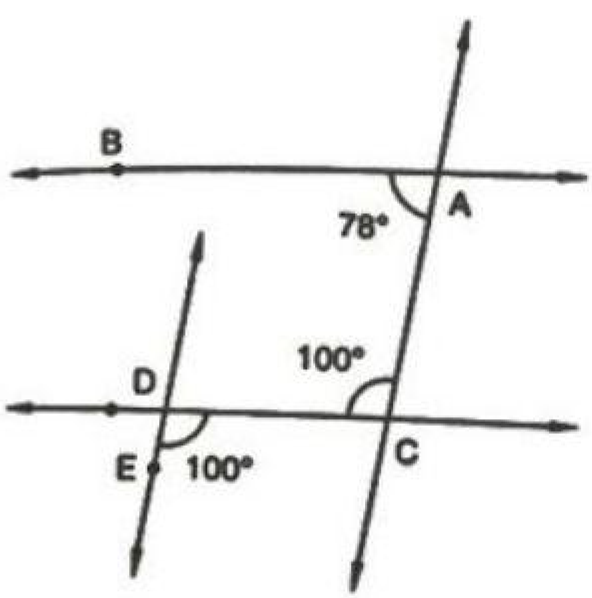


Fig. 86

Sol:

Let, F be the point of intersection of the line CD and the line passing through point E.

Here, $\angle ACD$ and $\angle CDE$ are alternate and equal angles.

So, $\angle ACD = \angle CDE = 100^{\circ}$

Therefore, AC || EF

Q30. In Fig. 87, the corresponding arms of $\angle ABC$ and $\angle DEF$ are parallel. If $\angle ABC = 75^{\circ}$, find $\angle DEF$.

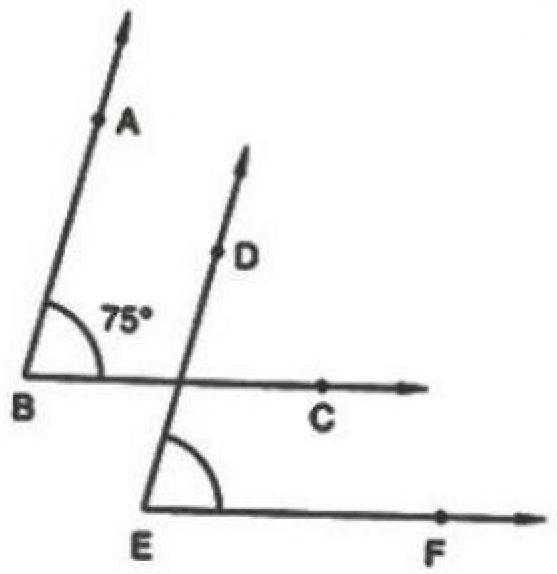


Fig. 87

Sol:

Let, G be the point of intersection of the lines BC and DE

Since, AB || DE and BC || EF

The corresponding angles,

=> $\angle ABC = \angle DGC = \angle DEF = 100^{\circ}$