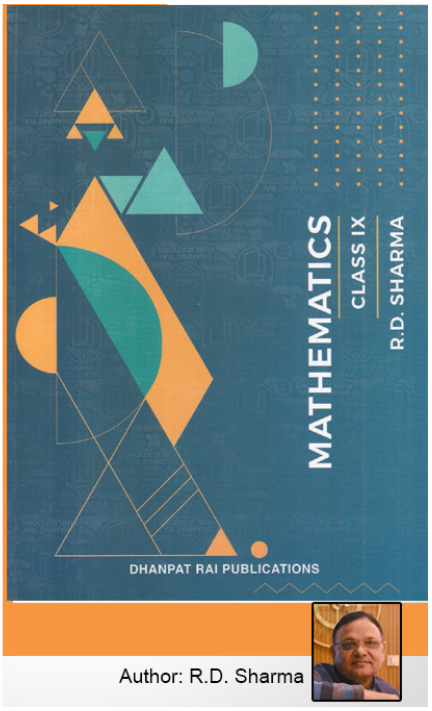
# Class 9 - Chapter 8 Lines and Angles




# RD Sharma Solutions for Class 9 Maths Chapter 8–Lines and Angles

Class 9: Maths Chapter 8 solutions. Complete Class 9 Maths Chapter 8 Notes.

## RD Sharma Solutions for Class 9 Maths Chapter 8–Lines and Angles

RD Sharma 9th Maths Chapter 8, Class 9 Maths Chapter 8 solutions

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**Exercise 8.1**

**Question 1: Write the complement of each of the following angles:**

**(i)$20^0$**

**(ii)$35^0$**

**(iii)$90^0$**

**(iv) $77^0$**

**(v)$30^0$**

**Solution**:

**(i)** The sum of an angle and its complement = $90^0$

Therefore, the complement of $20^0 = 90^0 – 20^0 = 70^0$

**(ii)** The sum of an angle and its complement = $90^0$

Therefore, the complement of $35° = 90° – 35° = 55$

**(iii)** The sum of an angle and its complement = $90^0$

Therefore, the complement of $90^0 = 90^0 – 90^0 = 0^0$

**(iv)** The sum of an angle and its complement = $90^0$

Therefore, the complement of $77^0 = 90° – 77^0 = 13^0$

**(v)** The sum of an angle and its complement = $90^0$

Therefore, the complement of $30^0 = 90^0 – 30^0 = 60^0$

**Question 2 : Write the supplement of each of the following angles:**

**(i) $54^0$**

**(ii) $132^0$**

**(iii) $138^0$**

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**Solution:**

**(i)** The sum of an angle and its supplement = $180^0$.

Therefore supplement of angle $54^0 = 180^0 – 54^0 = 126^0$

**(ii)** The sum of an angle and its supplement = $180^0$.

Therefore supplement of angle $132^0 = 180^0 – 132^0 = 48^0$

**(iii)** The sum of an angle and its supplement = $180^0$.

Therefore supplement of angle $138^0 = 180^0 – 138^0 = 42^0$

**Question 3: If an angle is $28^0$ less than its complement, find its measure?**

**Solution:**

Let the measure of any angle is ‘ a ‘ degrees

Thus, its complement will be $(90 – a)^0$

So, the required angle = Complement of a – 28

a = ( 90 – a ) – 28

2a = 62

a = 31

Hence, the angle measured is $31^0$.

**Question 4 : If an angle is 30° more than one half of its complement, find the measure of the angle?**

**Solution**:

Let an angle measured by ‘ a ‘ in degrees

Thus, its complement will be $(90 – a)^0$

Required Angle = $30^0$ + complement/2

a = $30^0$ + ( 90 – a )$^0$ / 2

$a + a/2 = 30^0 + 45^0$

$3a/2 = 75^0$

$a = 50^0$

Therefore, the measure of required angle is $50^0$.

**Question 5 : Two supplementary angles are in the ratio 4:5. Find the angles?**

**Solution**:

Two supplementary angles are in the ratio 4:5.

Let us say, the angles are 4a and 5a (in degrees)

Since angle are supplementary angles;

Which implies, $4a + 5a = 180^0$

$9a = 180^0$

$a = 20^0$

Therefore, $4a = 4\ (20) = 80^0$ and

$5(a) = 5\ (20) = 100^0$

Hence, required angles are 80° and $100^0$.

**Question 6 : Two supplementary angles differ by $48^0$. Find the angles?**

**Solution**: Given: Two supplementary angles differ by $48^0$.

Consider $a^0$ be one angle then its supplementary angle will be equal to $(180 – a)^0$

According to the question;

$(180 – a ) – x = 48$

$(180 – 48 ) = 2a$

$132 = 2a$

132/2 = a

Or a = $66^0$

Therefore, 180 – a = $114^0$

Hence, the two angles are $66^0$ and $114^0$.

**Question 7: An angle is equal to 8 times its complement. Determine its measure?**

**Solution:** Given: Required angle = 8 times of its complement

Consider $a^0$ be one angle then its complementary angle will be equal to $(90 – a)^0$

According to the question;

a = 8 times of its complement

a = 8 ( 90 – a )

a = 720 – 8a

a + 8a = 720

9a = 720

a = 80

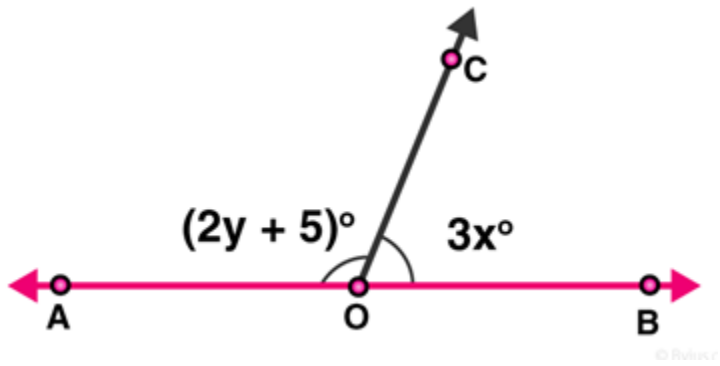
Therefore, the required angle is $80^0$.

**Exercise 8.2**

**Question 1: In the below Fig. OA and OB are opposite rays:**

**(i) If x = $25^0$, what is the value of y?**

**(ii) If y = $35^0$, what is the value of x?**




**Solution:**

**(i)** Given: x = 25

From figure: ∠AOC and ∠BOC form a linear pair

Which implies, ∠AOC + ∠BOC = $180^0$

From the figure, ∠AOC = 2y + 5 and ∠BOC = 3x

∠AOC + ∠BOC = $180^0$

(2y + 5) + 3x = 180

(2y + 5) + 3 (25) = 180

2y + 5 + 75 = 180

2y + 80 = 180

2y = 100

y = 100/2 = 50

Therefore, y = $50^0$

**(ii)** Given: y = $35^0$

From figure: ∠AOC + ∠BOC = 180° (Linear pair angles)

(2y + 5) + 3x = 180

(2(35) + 5) + 3x = 180

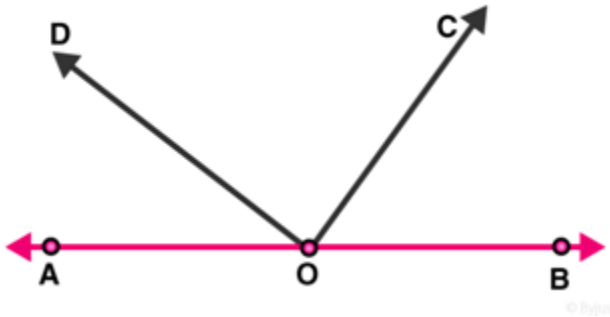
75 + 3x = 180

3x = 105

x = 35

Therefore, x = $35^0$

**Question 2: In the below figure, write all pairs of adjacent angles and all the linear pairs.**

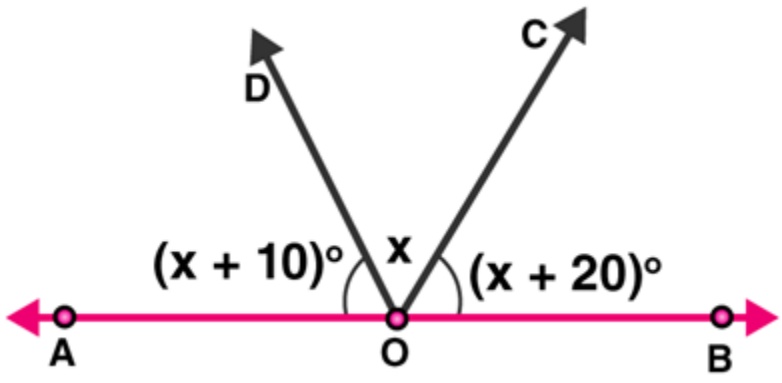



**Solution**: From figure, pairs of adjacent angles are :

(∠AOC, ∠COB) ; (∠AOD, ∠BOD) ; (∠AOD, ∠COD) ; (∠BOC, ∠COD)

And Linear pair of angles are (∠AOD, ∠BOD) and (∠AOC, ∠BOC).[As ∠AOD + ∠BOD = $180^0$ and ∠AOC+ ∠BOC = $180^0$.]

**Question 3 : In the given figure, find x. Further find ∠BOC , ∠COD and ∠AOD.**




**Solution:**

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From figure, ∠AOD and ∠BOD form a linear pair,

Therefore, $\angle AOD + \angle BOD = 180^0$

Also, $\angle AOD + \angle BOC + \angle COD = 180^0$

Given: $\angle AOD = (x+10)^0$ , $\angle COD = x^0$ and $\angle BOC = (x + 20)^0$

$( x + 10 ) + x + ( x + 20 ) = 180$

$3x + 30 = 180$

$3x = 180 – 30$

$x = 150/3$

$x = 50^0$

Now,

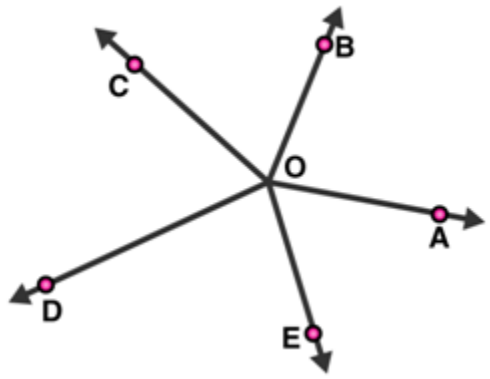
$\angle AOD=(x+10) =50 + 10 = 60$

$\angle COD = x = 50$

$\angle BOC = (x+20) = 50 + 20 = 70$

Hence, $\angle AOD=60^0$, $\angle COD=50^0$ and $\angle BOC=70^0$

**Question 4: In figure, rays OA, OB, OC, OD and OE have the common end point 0. Show that ∠AOB+∠BOC+∠COD+∠DOE+∠EOA=360°.**

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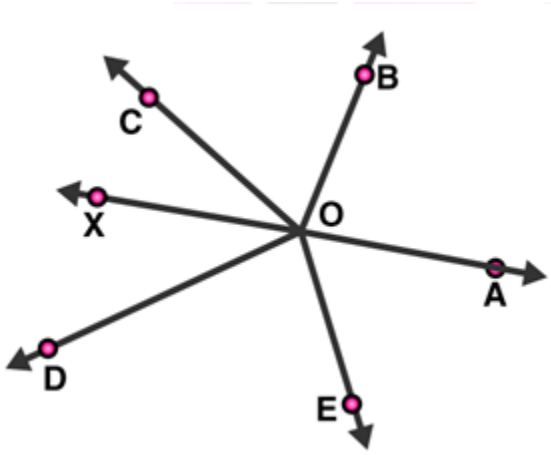
**Solution:**

Given: Rays OA, OB, OC, OD and OE have the common endpoint O.

Draw an opposite ray OX to ray OA, which make a straight line AX.




From figure:

∠AOB and ∠BOX are linear pair angles, therefore,

$\angle AOB + \angle BOX = 180^0$

Or, $\angle AOB + \angle BOC + \angle COX = 180^0$ ———(1)

Also,

∠AOE and ∠EOX are linear pair angles, therefore,

$\angle AOE + \angle EOX = 180°$

Or, $\angle AOE + \angle DOE + \angle DOX = 180^0$ ——(2)

By adding equations, (1) and (2), we get;

$\angle AOB + \angle BOC + \angle COF + \angle AOE + \angle DOE + \angle DOX = 180^0 + 180^0$

$\angle AOB + \angle BOC + \angle COD + \angle DOE + \angle EOA = 360^0$

Hence Proved.

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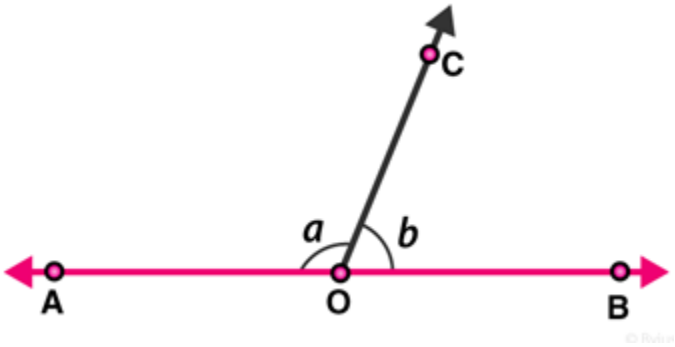
**Question 5 : In figure, ∠AOC and ∠BOC form a linear pair. If a – 2b = 30°, find a and b?**




**Solution:**

Given : ∠AOC and ∠BOC form a linear pair.

=> a + b = $180^0$ …..(1)

a – 2b = $30^0$ …(2) (given)

On subtracting equation (2) from (1), we get

a + b – a + 2b = 180 – 30

3b = 150

b = 150/3

b = $50^0$

Since, a – 2b = $30^0$

a – 2(50) = 30

a = 30 + 100

a = $130^0$

Therefore, the values of a and b are 130° and 50° respectively.

**Question 6: How many pairs of adjacent angles are formed when two lines intersect at a point?**

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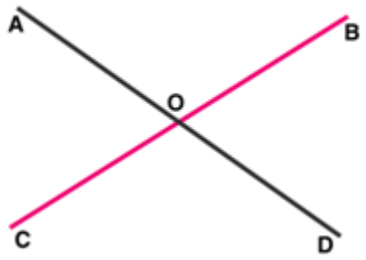
**Solution**: Four pairs of adjacent angles are formed when two lines intersect each other at a single point.

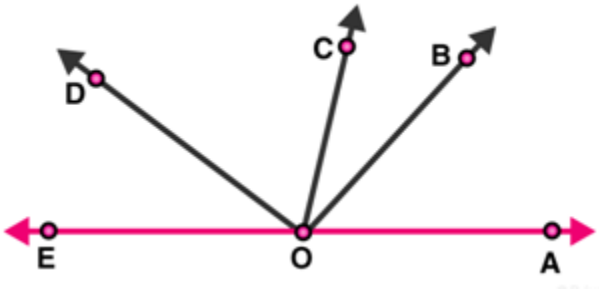
For example, Let two lines AB and CD intersect at point O.




The 4 pair of adjacent angles are :

$(\angle AOD, \angle DOB), (\angle DOB, \angle BOC), (\angle COA, \angle AOD)$ and $(\angle BOC, \angle COA)$.

**Question 7: How many pairs of adjacent angles, in all, can you name in figure given?**




**Solution**: Number of Pairs of adjacent angles, from the figure, are :

$\angle EOC$ and $\angle DOC$

$\angle EOD$ and $\angle DOB$

$\angle DOC$ and $\angle COB$

$\angle EOD$ and $\angle DOA$

$\angle DOC$ and $\angle COA$

$\angle BOC$ and $\angle BOA$

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∠BOA and ∠BOD

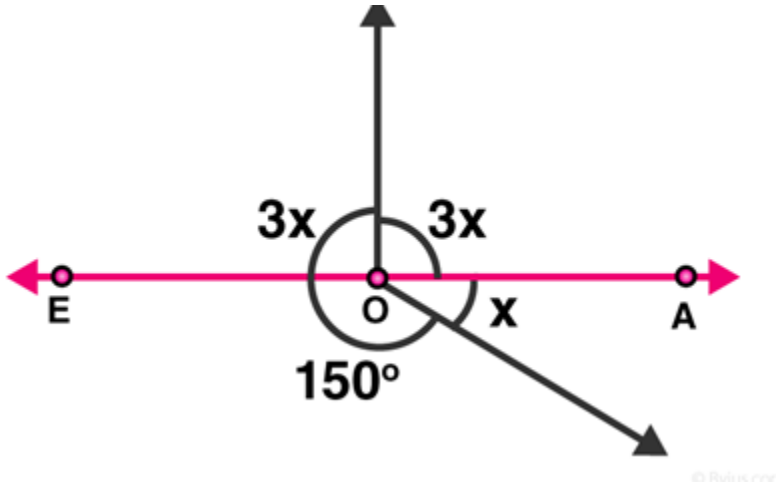
∠BOA and ∠BOE

∠EOC and ∠COA

∠EOC and ∠COB

Hence, there are 10 pairs of adjacent angles.

**Question 8: In figure, determine the value of x.**




**Solution**:

The sum of all the angles around a point O is equal to 360°.

Therefore,

$3x + 3x + 150 + x = 360^0$

$7x = 360^0 – 150^0$

$7x = 210^0$

$x = 210/7$

$x = 30^0$

Hence, the value of x is 30°.

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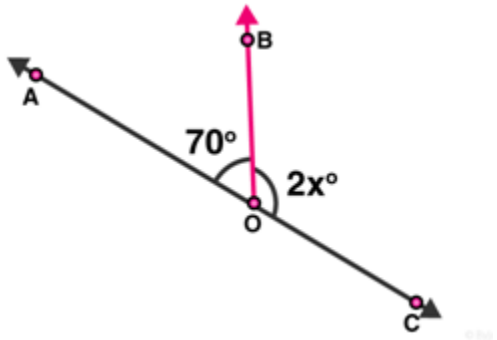
**Question 9: In figure, AOC is a line, find x.**




**Solution:**

From the figure, ∠AOB and ∠BOC are linear pairs,

∠AOB +∠BOC =180°

70 + 2x = 180

2x = 180 – 70

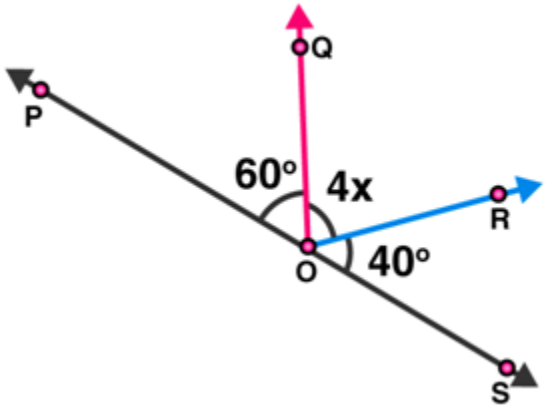
2x = 110

x = 110/2

x = 55

Therefore, the value of x is $55^0$.

**Question 10: In figure, POS is a line, find x.**




**Solution:**

From figure, ∠POQ and ∠QOS are linear pairs.

Therefore,

$\angle POQ + \angle QOS = 180^0$

$\angle POQ + \angle QOR + \angle SOR = 180^0$

$60^0 + 4x + 40^0 = 180^0$

$4x = 180^0 - 100^0$

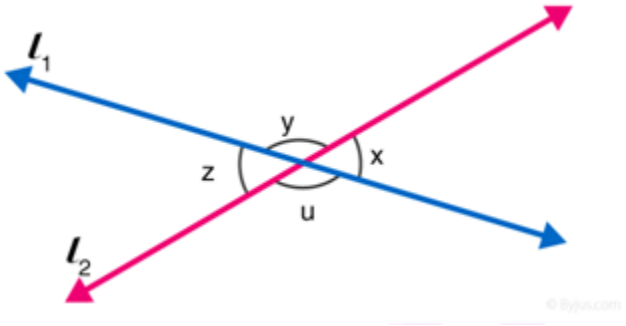
$4x = 80^0$

$x = 20^0$

Hence, the value of x is $20^0$.

**Exercise 8.3**

**Question 1: 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.**




**Solution**:

Given: $x = 45^0$

Since vertically opposite angles are equal, therefore $z = x = 45^0$

z and u are angles that are a linear pair, therefore, $z + u = 180^0$

Solve, $z + u = 180^0$ , for u

$u = 180^0 – z$

$u = 180^0 – 45$

$u = 135^0$

Again, x and y angles are a linear pair.

$x+ y = 180^0$

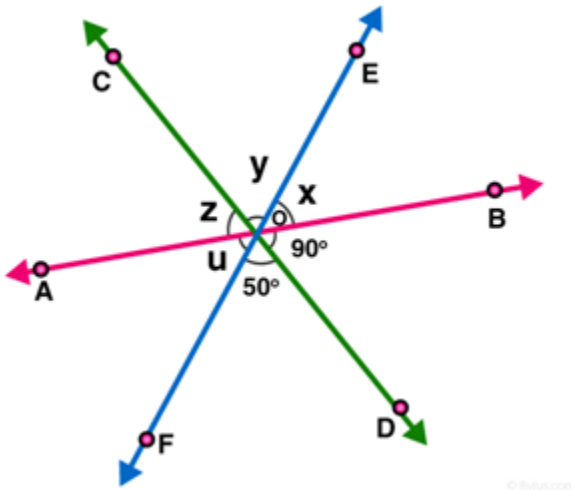
$y = 180^0 – x$

$y =180^0 – 45^0$

$y = 135^0$

Hence, remaining angles are $y = 135^0$, $u = 135^0$ and $z = 45^0$.

**Question 2 : In figure, three coplanar lines intersect at a point O, forming angles as shown in the figure. Find the values of x, y, z and u .**




**Solution**:

(∠BOD, z); (∠DOF, y ) are pair of vertically opposite angles.

So, ∠BOD = z = $90^0$

∠DOF = y = $50^0$[Vertically opposite angles are equal.]

Now, x + y + z = 180 [Linear pair] [AB is a straight line]

x + y + z = 180

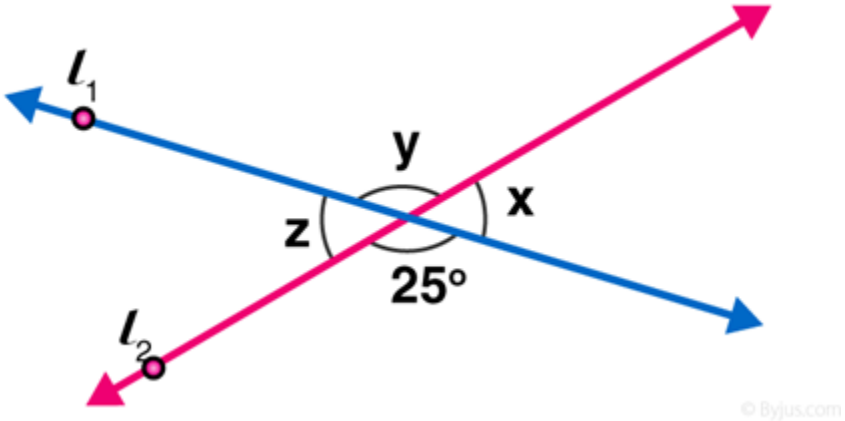
x + 50 + 90 = 180

x = 180 – 140

x = 40

Hence values of x, y, z and u are $40^0$, $50^0$, $90^0$ and $40^0$ respectively.

**Question 3 : In figure, find the values of x, y and z.**




**Solution:**

From figure,

y = $25^0$ [Vertically opposite angles are equal]

Now ∠x + ∠y = $180^0$ [Linear pair of angles]

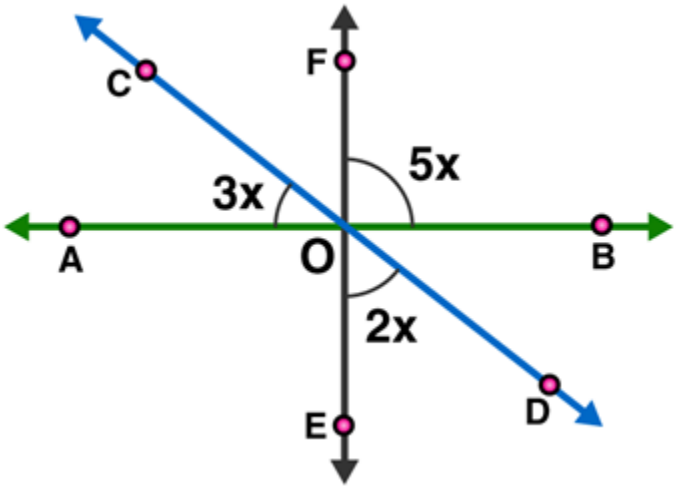
x = 180 – 25

x = 155

Also, z = x = 155 [Vertically opposite angles]

Answer: y = $25^0$ and z = $155^0$

**Question 4 : In figure, find the value of x.**




**Solution:**

∠AOE = ∠BOF = 5x [Vertically opposite angles]

∠COA+∠AOE+∠EOD = $180^0$ [Linear pair]

3x + 5x + 2x = 180

10x = 180

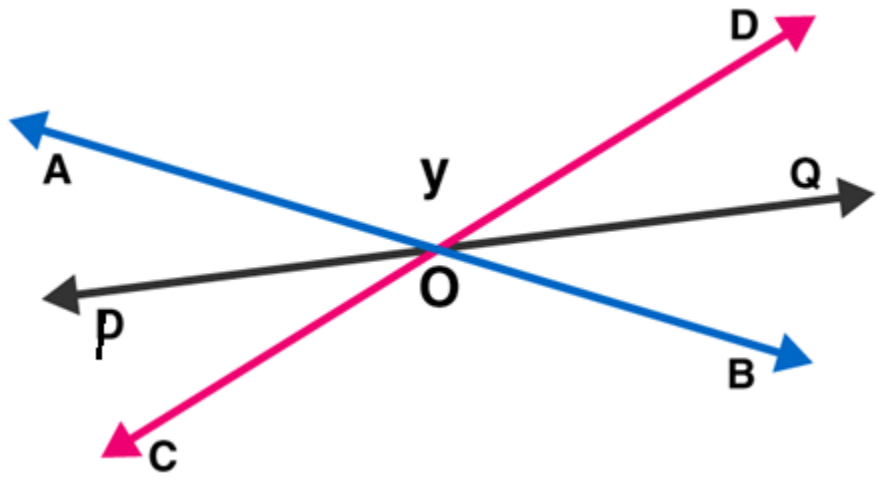
x = 180/10

x = 18

The value of x = $18^0$

**Question 5 : Prove that bisectors of a pair of vertically opposite angles are in the same straight line.**

**Solution:**




Lines AB and CD intersect at point O, such that

$\angle AOC = \angle BOD$ (vertically angles) …(1)

Also OP is the bisector of AOC and OQ is the bisector of BOD

To Prove: POQ is a straight line.

OP is the bisector of $\angle AOC$:

$\angle AOP = \angle COP$ …(2)

OQ is the bisector of $\angle BOD$:

$\angle BOQ = \angle QOD$ …(3)

Now,

Sum of the angles around a point is $360^o$.

$\angle AOC + \angle BOD + \angle AOP + \angle COP + \angle BOQ + \angle QOD = 360^0$

$\angle BOQ + \angle QOD + \angle DOA + \angle AOP + \angle POC + \angle COB = 360^0$

$2\angle QOD + 2\angle DOA + 2\angle AOP = 360^0$ (Using (1), (2) and (3))

$\angle QOD + \angle DOA + \angle AOP = 180^0$

$POQ = 180^0$

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Which shows that, the bisectors of pair of vertically opposite angles are on the same straight line.

Hence Proved.

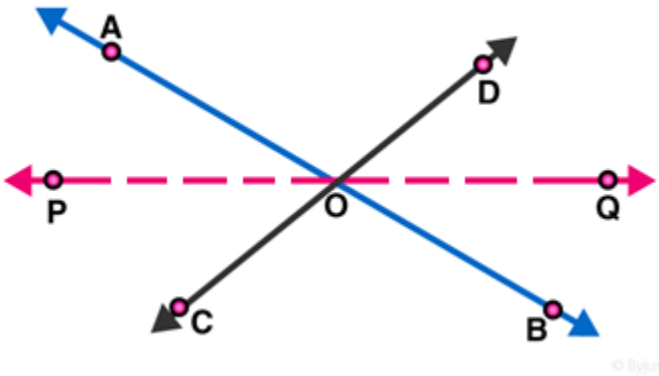
**Question 6 : If two straight lines intersect each other, prove that the ray opposite to the bisector of one of the angles thus formed bisects the vertically opposite angle.**

**Solution:** Given AB and CD are straight lines which intersect at O.

OP is the bisector of ∠ AOC.

To Prove : OQ is the bisector of ∠BOD

Proof :




AB, CD and PQ are straight lines which intersect in O.

Vertically opposite angles: ∠ AOP = ∠ BOQ

Vertically opposite angles: ∠ COP = ∠ DOQ

OP is the bisector of ∠ AOC : ∠ AOP = ∠ COP

Therefore, ∠BOQ = ∠ DOQ

Hence, OQ is the bisector of ∠BOD.

**Exercise 8.4**

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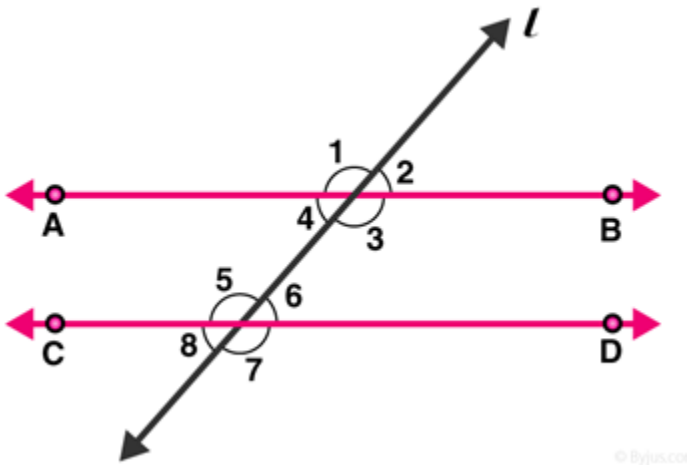
**Question 1: In figure, AB, CD and ∠1 and ∠2 are in the ratio 3 : 2. Determine all angles from 1 to 8.**




**Solution:**

Let ∠1 = 3x and ∠2 = 2x

From figure: ∠1 and ∠2 are linear pair of angles

Therefore, ∠1 + ∠2 = 180

3x + 2x = 180

5x = 180

x = 180 / 5

=> x = 36

So, ∠1 = 3x = $108^0$ and ∠2 = 2x = $72^0$

As we know, vertically opposite angles are equal.

Pairs of vertically opposite angles are:

(∠1 = ∠3); (∠2 = ∠4) ; (∠5, ∠7) and (∠6 , ∠8)

∠1 = ∠3 = 108°

∠2 = ∠4 = 72°

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∠5 = ∠7

∠6 = ∠8

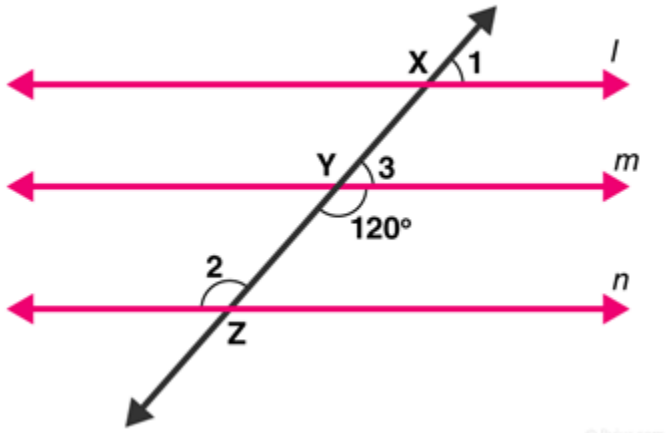
We also know, if a transversal intersects any parallel lines, then the corresponding angles are equal

∠1 = ∠5 = ∠7 = 108°

∠2 = ∠6 = ∠8 = 72°

Answer: ∠1 = 108°, ∠2 = 72°, ∠3 = 108°, ∠4 = 72°, ∠5 = 108°, ∠6 = 72°, ∠7 = 108° and ∠8 = 72°

**Question 2: In figure, l, m and n are parallel lines intersected by transversal p at X, Y and Z respectively. Find ∠1, ∠2 and ∠3.**




**Solution:** From figure:

∠Y = 120° [Vertical opposite angles]

∠3 + ∠Y = 180° [Linear pair angles theorem]

=> ∠3= 180 – 120

=> ∠3= 60°

Line l is parallel to line m,

∠1 = ∠3 [ Corresponding angles]

∠1 = 60°

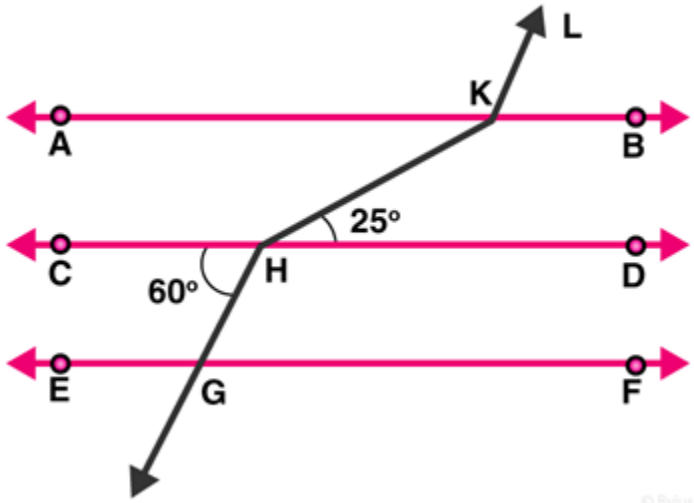
Also, line m is parallel to line n,

∠2 = ∠Y [Alternate interior angles are equal]

∠2 = 120°

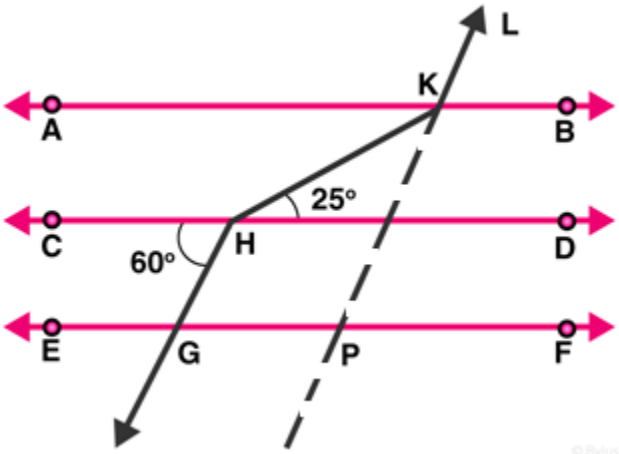
Answer: ∠1 = 60°, ∠2 = 120° and ∠3 = 60°.

**Question 3: In figure, AB || CD || EF and GH || KL. Find ∠HKL.**




**Solution:**

Extend LK to meet line GF at point P.




From figure, CD || GF, so, alternate angles are equal.

∠CHG =∠HGP = 60°

∠HGP =∠KPF = 60° [Corresponding angles of parallel lines are equal]

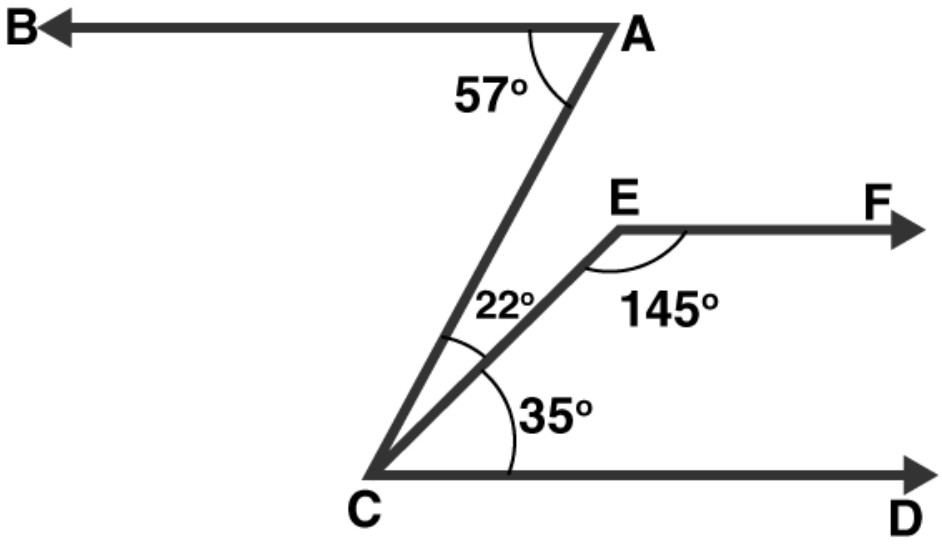
Hence, ∠KPG =180 – 60 = 120°

=> ∠GPK = ∠AKL= 120° [Corresponding angles of parallel lines are equal]

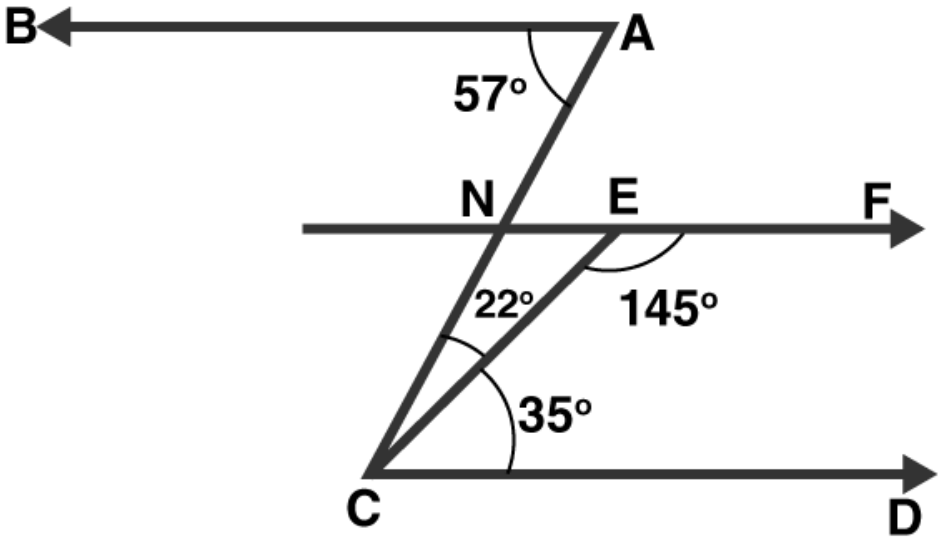
∠AKH = ∠KHD = 25° [alternate angles of parallel lines]

Therefore, ∠HKL = ∠AKH + ∠AKL = 25 + 120 = 145°

**Question 4: In figure, show that AB || EF.**




**Solution:** Produce EF to intersect AC at point N.




From figure, ∠BAC = 57° and

∠ACD = 22°+35° = 57°

Alternative angles of parallel lines are equal

=> BA || EF …..(1)

Sum of Co-interior angles of parallel lines is 180°

EF || CD

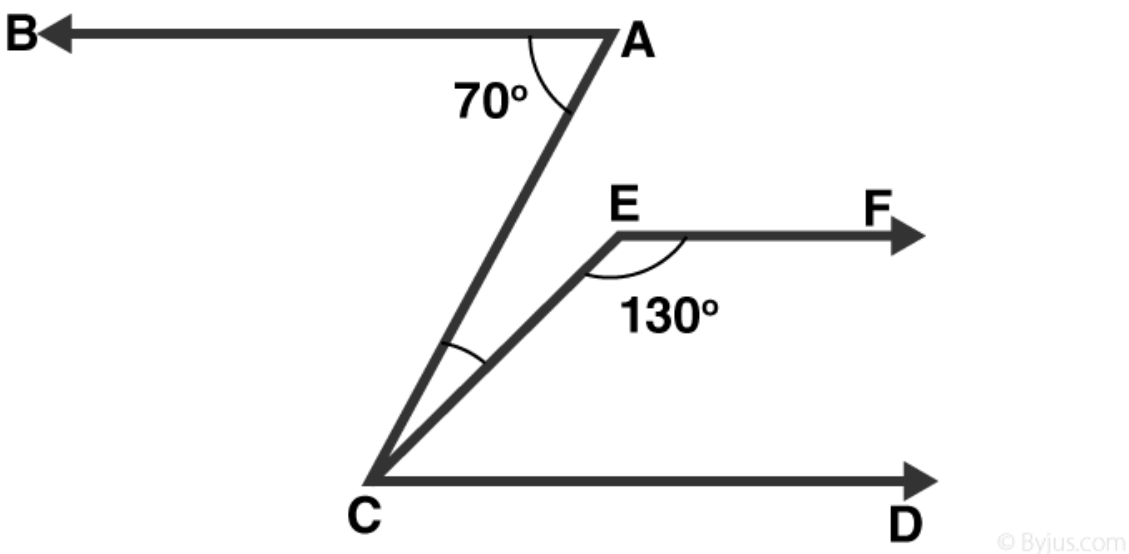
∠DCE + ∠CEF = 35 + 145 = 180° …(2)

From (1) and (2)

AB || EF[Since, Lines parallel to the same line are parallel to each other]

Hence Proved.

**Question 5 : In figure, if AB || CD and CD || EF, find ∠ACE.**




**Solution:**

Given: CD || EF

∠ FEC + ∠ECD = 180°[Sum of co-interior angles is supplementary to each other]

=> ∠ECD = 180° – 130° = 50°

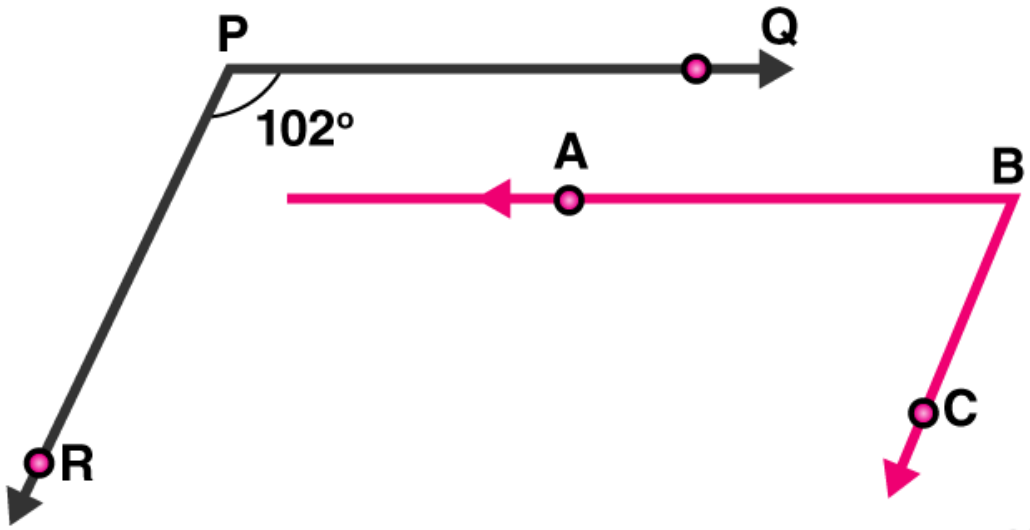
Also, BA || CD

=> ∠BAC = ∠ACD = 70°[Alternative angles of parallel lines are equal]

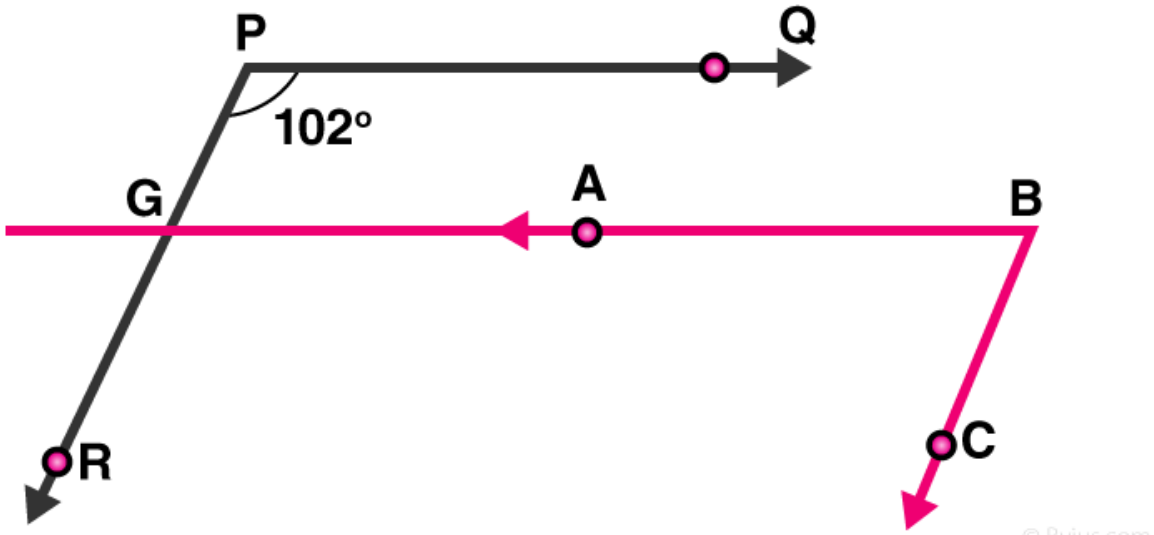
But, ∠ACE + ∠ECD =70°

=> ∠ACE = 70° — 50° = 20°

**Question 6: In figure, PQ || AB and PR || BC. If ∠QPR = 102°, determine ∠ABC. Give reasons.**




**Solution:** Extend line AB to meet line PR at point G.




Given: PQ || AB,

∠QPR = ∠BGR =102°[Corresponding angles of parallel lines are equal]

And PR || BC,

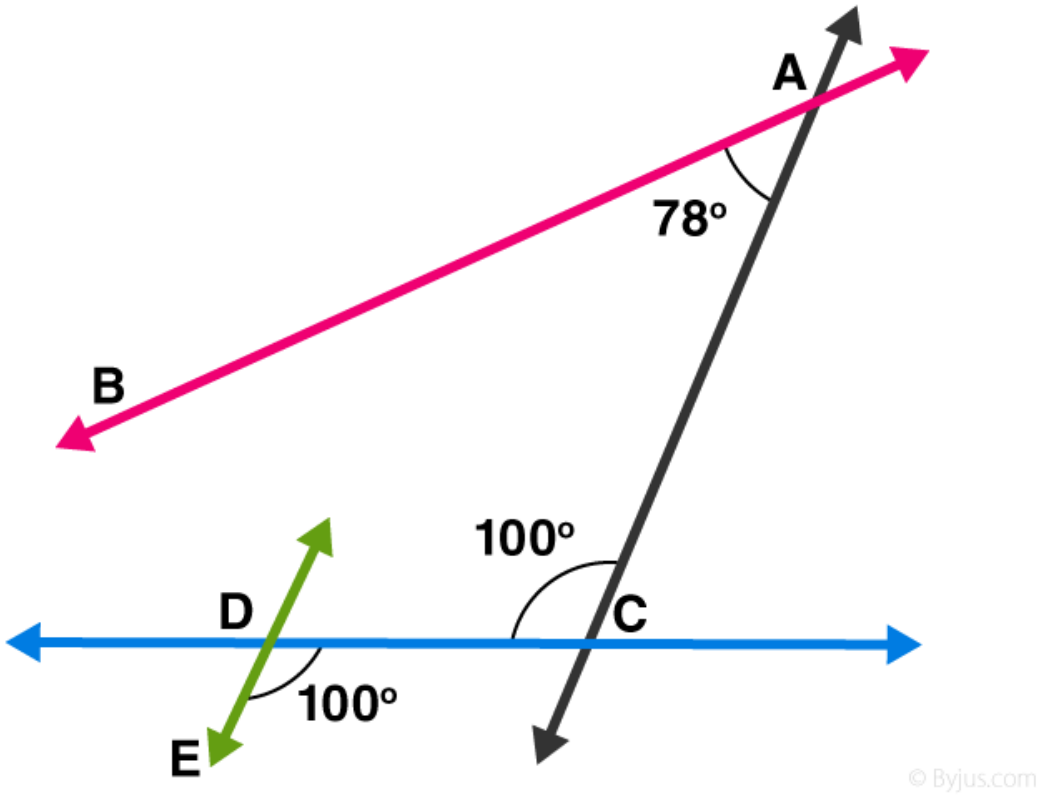
∠RGB+ ∠CBG =180°[Corresponding angles are supplementary]

∠CBG = 180° – 102° = 78°

Since, ∠CBG = ∠ABC

=>∠ABC = 78°

**Question 7 : In figure, state which lines are parallel and why?**




**Solution:**

We know, If a transversal intersects two lines such that a pair of alternate interior angles are equal, then the two lines are parallel

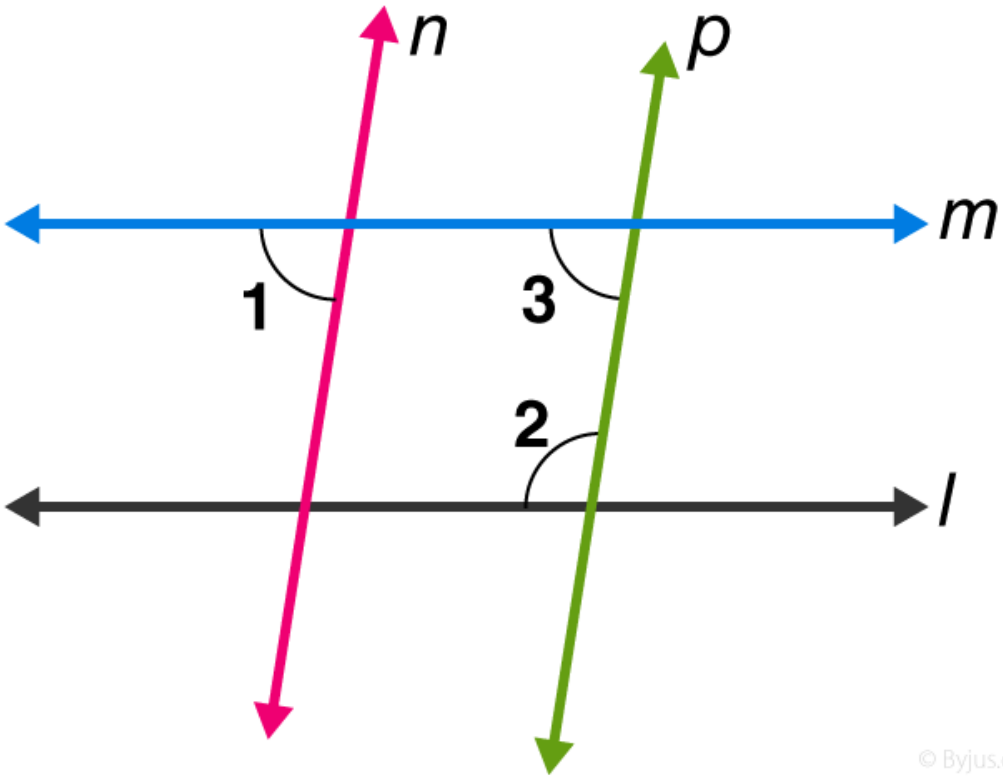
From figure:

=> ∠EDC = ∠DCA = 100°

Lines DE and AC are intersected by a transversal DC such that the pair of alternate angles are equal.

So, DE || AC

**Question 8: In figure, if l||m, n || p and ∠1 = 85°, find ∠2.**




**Solution:**

Given: ∠1 = 85°

As we know, when a line cuts the parallel lines, the pair of alternate interior angles are equal.

=> ∠1 = ∠3 = 85°

Again, co-interior angles are supplementary, so

∠2 + ∠3 = 180°

∠2 + 55° =180°

∠2 = 180° – 85°

∠2 = 95°

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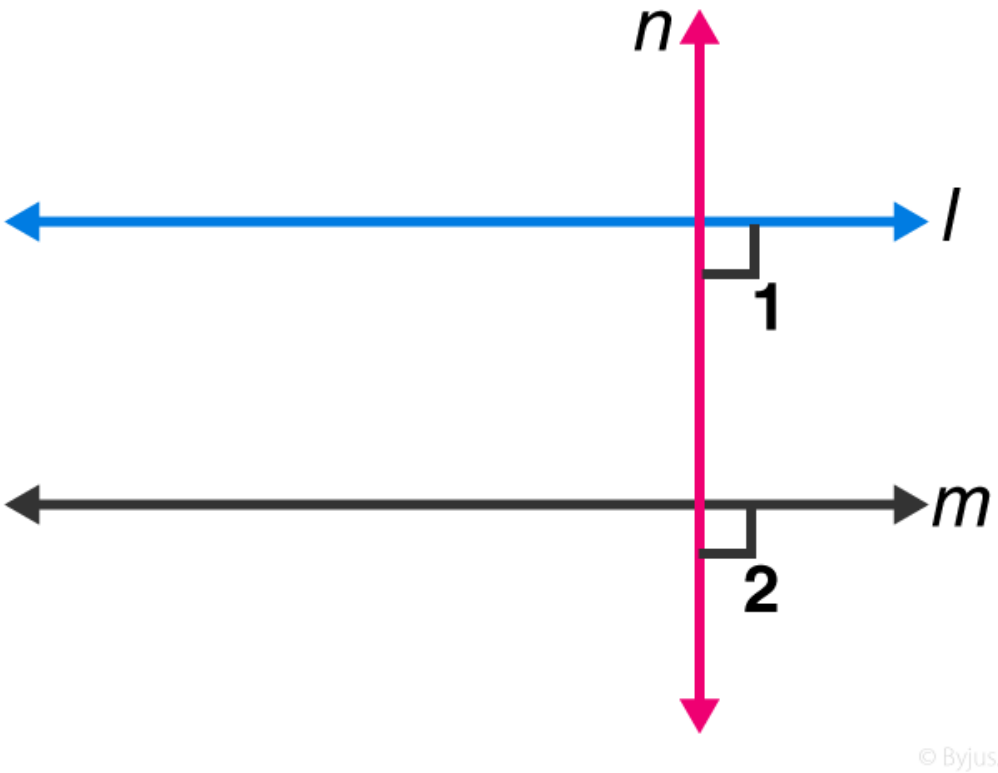
**Question 9 : If two straight lines are perpendicular to the same line, prove that they are parallel to each other.**

**Solution:**

Let lines l and m are perpendicular to n, then

∠1= ∠2=90°




Since, lines l and m cut by a transversal line n and the corresponding angles are equal, which shows that, line l is parallel to line m.

**Question 10: Prove that if the two arms of an angle are perpendicular to the two arms of another angle, then the angles are either equal or supplementary.**

**Solution:** Let the angles be ∠ACB and ∠ABD

Let AC perpendicular to AB, and CD is perpendicular to BD.

To Prove : ∠ACD = ∠ABD OR ∠ACD + ∠ABD =180°

Proof :

In a quadrilateral,

∠A+ ∠C+ ∠D+ ∠B = 360°[ Sum of angles of quadrilateral is 360° ]

=> 180° + ∠C + ∠B = 360°

=> ∠C + ∠B = 360° –180°

Therefore, ∠ACD + ∠ABD = 180°

And ∠ABD = ∠ACD = 90°

Hence, angles are equal as well as supplementary.

**Exercise VSAQs**

**Question 1: Define complementary angles.**

**Solution:** When the sum of two angles is 90 degrees, then the angles are known as complementary angles.

**Question 2: Define supplementary angles.**

**Solution:** When the sum of two angles is 180°, then the angles are known as supplementary angles.

**Question 3: Define adjacent angles.**

**Solution:** Two angles are Adjacent when they have a common side and a common vertex.

**Question 4: The complement of an acute angle is _____.**

**Solution**: An acute angle

**Question 5: The supplement of an acute angle is _____.**

**Solution:** An obtuse angle

**Question 6: The supplement of a right angle is _____.**

**Solution:** A right angle

# Chapterwise RD Sharma Solutions for Class 9 Maths :

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- Chapter 2–Exponents of Real Numbers
- Chapter 3–Rationalisation
- Chapter 4–Algebraic Identities
- Chapter 5–Factorization of Algebraic Expressions
- Chapter 6–Factorization Of Polynomials
- Chapter 7–Introduction to Euclid's Geometry
- Chapter 8–Lines and Angles
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- Chapter 24–Measure of Central Tendency
- Chapter 25–Probability

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# About  RD Sharma

RD Sharma i*sn't the kind of author you'd bump into at lit fests. But his bestselling books have helped many* CBSE *students lose their dread of* maths. *Sunday Times profiles the tutor turned internet star*

He dreams of algorithms that would give most people nightmares. And, spends every waking hour thinking of ways to explain concepts like 'series solution of linear differential equations'. Meet Dr Ravi Dutt Sharma — mathematics teacher and author of 25 reference books — whose name evokes as much awe as the subject he teaches. And though students have used his thick tomes for the last 31 years to ace the dreaded maths exam, it's only recently that a spoof video turned the tutor into a YouTube star.

R D Sharma had a good laugh but said he shared little with his on-screen persona except for the love for maths. "I like to spend all my time thinking and writing about maths problems. I find it relaxing," he says. When he is not writing books explaining mathematical concepts for classes 6 to 12 and engineering students, Sharma is busy dispensing his duty as vice-principal and head of department of science and humanities at Delhi government's Guru Nanak Dev Institute of Technology.