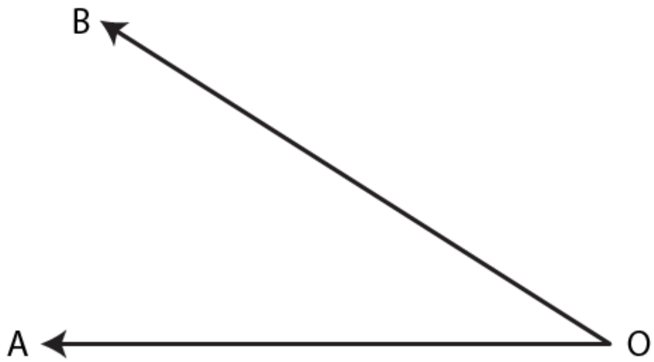
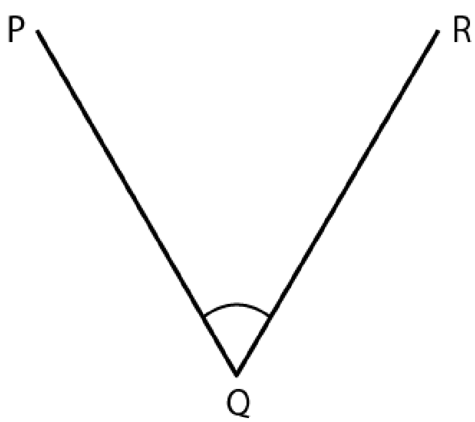
EXERCISE 24(A)

1. For each angle given below, write the name of the vertex, the names of the arms and the name of the angle.

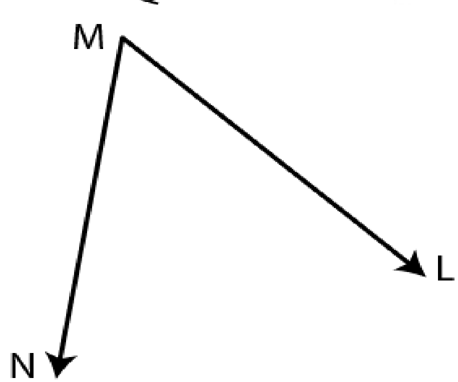
(i)



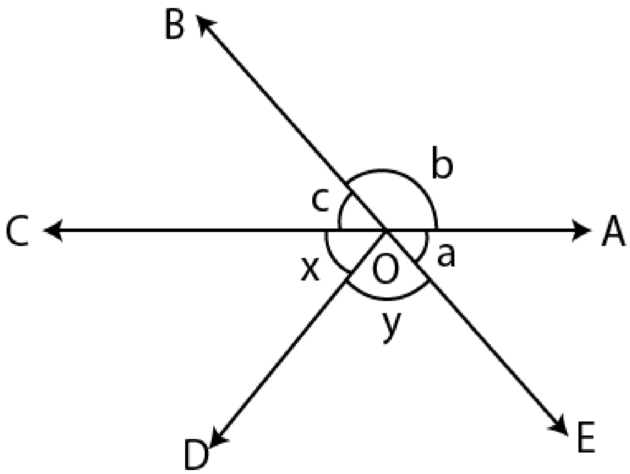
(ii)



(iii)



(iv) Name the angles marked by letters a, b, c, x and y.



Solution:

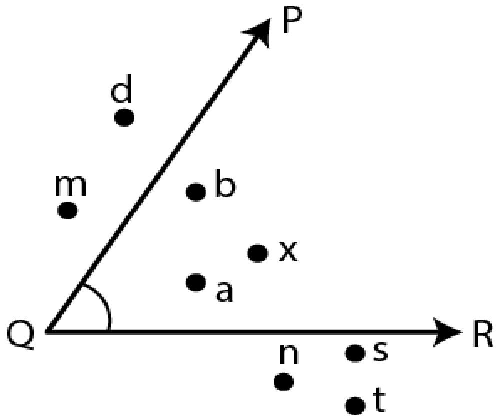
(i) In the given figure,
Vertex = O
Arms = OA and OB
Angle = ∠AOB or ∠BOA or ∠O

(ii) In the given figure,
Vertex = Q
Arms = QP and QR
Angle = ∠PQR or ∠RQP or ∠Q

(iii) In the given figure,
Vertex = M
Arms = MN and ML
Angle = ∠LMN or ∠NML or ∠M

(iv) a = ∠AOE
b = ∠AOB
c = ∠BOC
d = ∠COD
e = ∠DOE

2. Name the points:
(i) in the interior of the angle PQR,
(ii) in the exterior of the angle PQR.

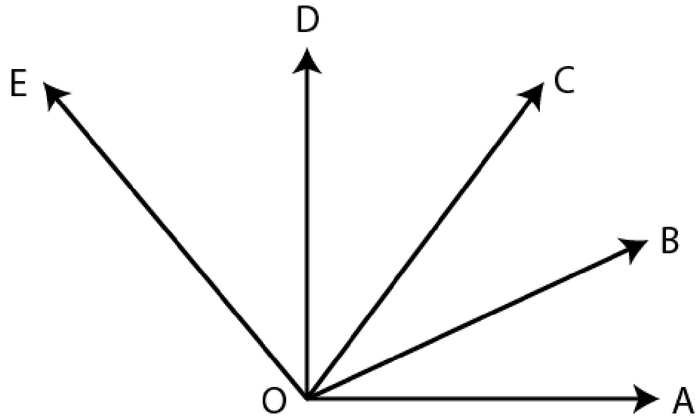


Solution:

(i) The points in the interior of the angle = a, b and x

(ii) The points in the exterior of the angle = d, m, n, s and t

3. In the given figure, figure out the number of angles formed within the arms OA and OE.



Solution:

In the given figure, the angles within the arms OA and OE are as follows:

(i) ∠AOE

(ii) ∠AOD

(iii) ∠AOC

(iv) ∠AOB

(v) ∠BOC

(vi) ∠BOD

(vii) ∠BOE

(viii) ∠COD

(ix) ∠COE and

(x) ∠DOE

4. Add:
(i) 29^0 16'23" and 8^0 27'12"
(ii) 9^0 45'56" and 73^0 8' 15"
(iii) 56^0 38' and 27^0 42' 30"
(iv) 47^0 and 61^0 17'4"
Solution:
(i) 29^0 16'23" + 8^0 27'12"
29^0 16'23"
8^0 27'12" +
____
37^0 43' 35"
____
Hence, addition of 29^0 16'23" and 8^0 27'12" = 37^0 43' 35"

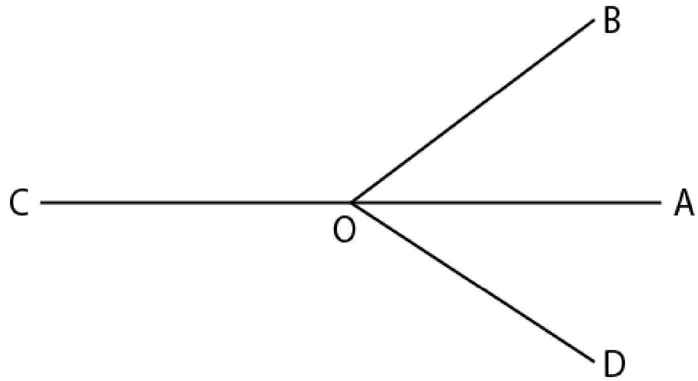
(ii) 9^0 45'56" + 73^0 8' 15"
9^0 45'56"
73^0 8' 15" +
____
82^0 53' 71"
____
Hence, addition of 9^0 45'56" and 73^0 8' 15" = 82^0 53' 71"

(iii) 56^0 38' + 27^0 42' 30"
56^0 38'
27^0 42' 30" +
____
83^0 80' 30"
____
Hence, addition of 56^0 38' and 27^0 42' 30" = 83^0 80' 30"

(iv) 47^0 + 61^0 17'4"
47^0
61^0 17'4" +
____
108^0 17' 4"
____
Hence, addition of 47^0 and 61^0 17'4" = 108^0 17' 4"

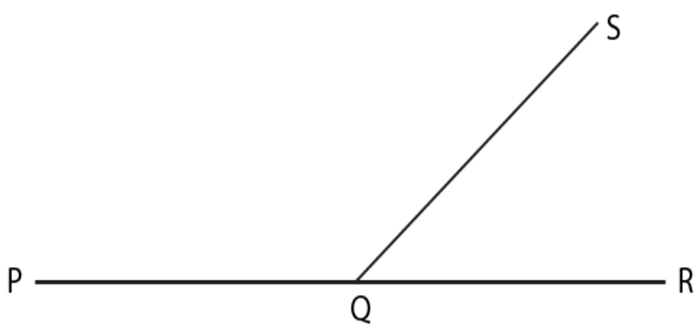
5. In the figure, given below name:

(i) three pairs of adjacent angles
(ii) two acute angles
(iii) two obtuse angles
(iv) two reflex angles



Solution:
(i) In the given figure, the three pairs of adjacent angles are as follows:
∠AOB and ∠BOC ,
∠BOC and ∠COD
∠COD and ∠DOA
(ii) In the given figure, the two acute angles are
∠AOB and ∠AOD
(iii) In the given figure, the two obtuse angles are
∠BOC and ∠COD
(iv) In the given figure, the two reflex angles are
∠AOB and ∠COB

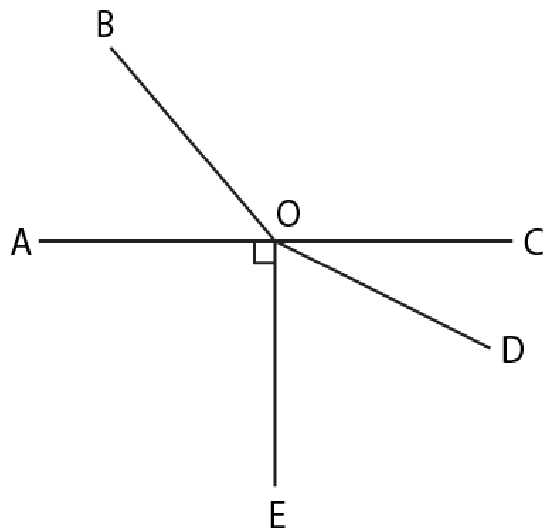
6. In the given figure; PQR is a straight line. If:
(i) ∠SQR = 75^0; find ∠PQS.
(ii) ∠PQS = 110^0; find ∠RQS



Solution:
(i) Given PQR is a straight line
In the given figure,

$\angle PQS + \angle SQR = 180^0$ {linear pair of angles}
$\angle PQ\ S + 75 = 180$
On further calculation, we get,
$\angle PQS = 180 – 75$
$\angle PQS = 105^0$
(ii) Given PQR is a straight line
$\angle PQS + \angle RQS = 180^0$
$110^0 + \angle RQS = 180^0$
On further calculation, we get,
$\angle RQS = 180^0 - 110^0$
$\angle RQS = 70^0$

7. In the given figure; AOC is a straight line. If angle AOB = 50^0, angle AOE = 90^0 and angle COD = 25^0; find the measure of:
(i) angle BOC
(ii) angle EOD
(iii) obtuse angle BOD
(iv) reflex angle BOD
(v) reflex angle COE

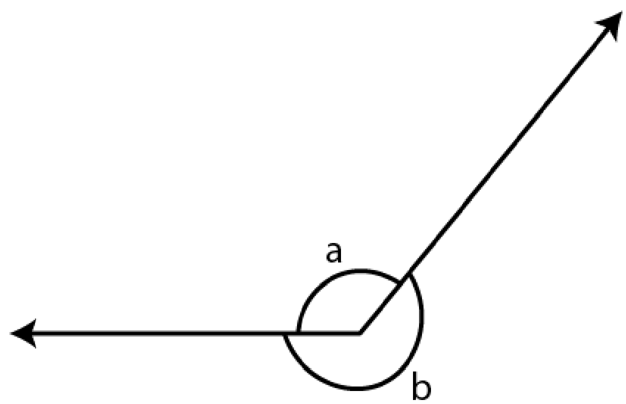


Solution:
(i) Given
AOC is a straight line
$\angle AOB = 50^0$
$\angle AOE = 90^0$
$\angle COD = 25^0$
To find the measure of $\angle BOC$
$\angle AOB + \angle BOC = 180^0$ (Linear pairs of angle)

$50^0 + \angle BOC = 180^0$
On further calculation, we get,
$\angle BOC = 180^0 – 50^0$
$\angle BOC = 130^0$
(ii) Given
AOC is a straight line
$\angle AOB = 50^0$
$\angle AOE = 90^0$
$\angle COD = 25^0$
To find the measure $\angle EOD$
$\angle EOD + \angle COD = 90^0$ (Since $\angle AOE = 90^0$)
$\angle EOD + 25^0 = 90^0$
$\angle EOD = 90^0 - 25^0$
We get,
$\angle EOD = 65^0$
(iii) Given
AOC is a straight line
$\angle AOB = 50^0$
$\angle AOE = 90^0$
$\angle COD = 25^0$
To find the measure of obtuse angle BOD,
$\angle BOD = \angle BOC + \angle COD$
Substituting the value of $\angle BOC$ and $\angle COD$, we get,
$\angle BOD = 130^0 + 25^0$
We get,
$\angle BOD = 155^0$
(iv) Given
AOC is a straight line
$\angle AOB = 50^0$
$\angle AOE = 90^0$
$\angle COD = 25^0$
To find the measure of reflex angel BOD
$\angle BOD = 360^0 – \angle BOD$
$= 360^0 - 155^0$
We get,
$\angle BOD = 205^0$
(iv) Given
AOC is a straight line
$\angle AOB = 50^0$

$\angle AOE = 90^0$
$\angle COD = 25^0$
To find the measure of reflex angle COE
$\angle COE = 360^0 - \angle COE$
$= 360^0 - (\angle COD + \angle EOD)$
$= 360^0 - (25^0 + 65^0)$
We get,
$= 360^0 - 90^0$
$\angle COE = 270^0$

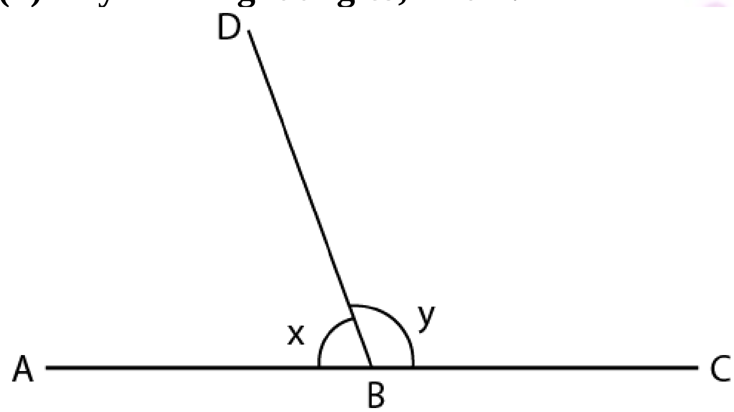
8. In the given figure if:
(i) a = 130^0; find b
(ii) b = 200; find a
(iii) a = 5 / 3 right angle, find b



Solution:
(i) From figure,
$a + b = 360^0$
Substitute the value of a in above equation
$130^0 + b = 360^0$
$b = 360^0 - 130^0$
We get,
$b = 230^0$
(ii) From figure,
$a + b = 360^0$
$a + 200^0 = 360^0$
$a = 360^0 - 200^0$
We get,
$a = 160^0$
(iii) From figure,

a = 5 / 3 right angle
= 5 / 3 × 90^0
We get,
a = 150^0
Now,
a + b = 360^0
Substitute the value of a in above equation
150^0 + b = 360^0
b = 360^0 - 150^0
b = 210^0

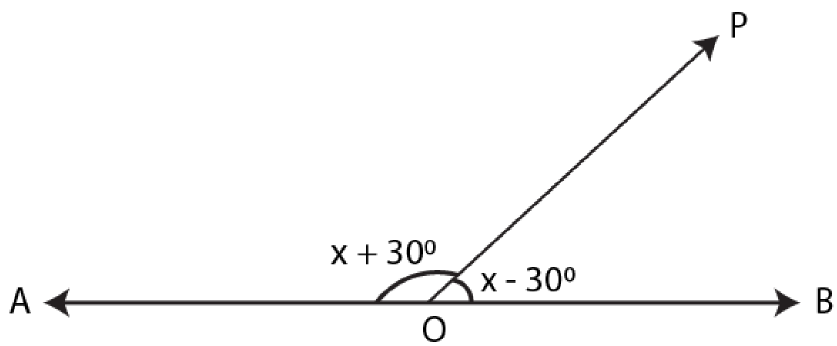
9. In the given diagram, ABC is a straight line
(i) If x = 53^0, find y
(ii) If y = $1\frac{1}{2}$ right angles; find x.



Solution:
(i) From the figure,
Given that ABC is a straight line
Hence,
∠ABD + ∠DBC = 180^0 {Linear pair of angles}
x + y = 180^0
53^0 + y = 180^0
y = 180^0 - 53^0
y = 127^0
(ii) From given figure,
x + y = 180^0
x + $1\frac{1}{2}$ right angles = 180^0
x + 3 / 2 × 90^0 = 180^0
On further calculation, we get

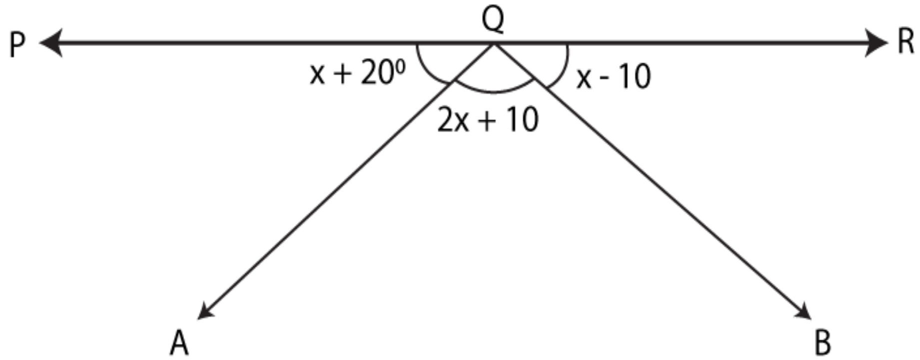
$x + 135^0 = 180^0$
$x = 180^0 - 135^0$
$x = 45^0$

10. In the given figure, AOB is a straight line. Find the value of x and also answer each of the following:
(i) ∠AOP = …….
(ii) ∠BOP = …….
(iii) which angle is obtuse?
(iv) which angle is acute?



Solution:
Given from figure,
$\angle AOP = x + 30^0$
$\angle BOP = x - 30^0$
Now,
$\angle AOP + \angle BOP = 180^0$ (Since ∠AOB is a straight line)
$(x + 30^0) + (x - 30^0) = 180^0$
$2x = 180^0$
We get,
$x = 90^0$
(i) $\angle AOP = x + 30^0$
$= 90^0 + 30^0$
$= 120^0$
(ii) $\angle BOP = x – 30^0$
$= 90^0 - 30^0$
We get,
$= 60^0$
(iii) The obtuse angle is ∠AOP
(iv) The acute angle is ∠BOP

11.In the given figure, PQR is a straight line. Find x. Then complete the following:
(i) ∠AQB = ……………
(ii) ∠BQP = ……………
(iii) ∠AQR = …………….



Solution:
Given
PQR is a straight line
$\angle AQP = x + 20^0$
$\angle AQB = 2x + 10^0$
$\angle BQR = x - 10^0$
Since PQR is a straight line
$\angle AQP + \angle AQB + \angle BQR = 180^0$
$(x + 20^0) + (2x + 10^0) + (x – 10^0) = 180^0$
We get,
$4x + 20^0 = 180^0$
$4x = 180^0 - 20^0$
$4x = 160^0$
$x = 160^0 / 4$
We get,
$x = 40^0$
(i) $\angle AQB = 2x + 10^0$
$= 2 \times 40^0 + 10^0$
$= 80^0 + 10^0$
$= 90^0$
Similarly,
$\angle AQP = x + 20^0$
$\angle AQP = 40^0 + 20^0$
$\angle AQP = 60^0$
$\angle BQR = x – 10^0$
$\angle BQR = 40^0 - 10^0$

$\angle BQR = 30^0$

(ii) $\angle BQP = \angle AQP + \angle AQB$

$= 60^0 + 90^0$

$= 150^0$

(iii) $\angle AQR = \angle AQB + \angle BQR$

$= 90^0 + 30^0$

$= 120^0$

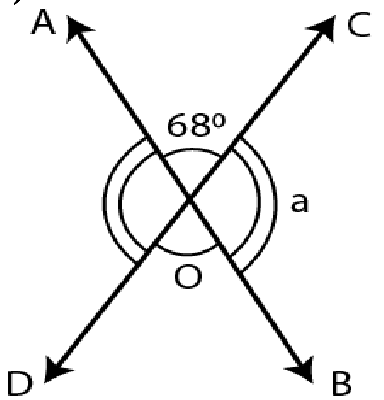
12. In the given figure, lines AB and CD intersect at point O.

(i) Find the value of ∠a.

(ii) Name all the pairs of vertically opposite angles.

(iii) Name all the pairs of adjacent angles

(iv) Name all the reflex angles formed and write the measure of each.



Solution:

Given

AB and CD intersect each other at point C

$\angle AOC = 68^0$

(i) Here, AOB is a line

Hence,

$\angle AOC + \angle BOC = 180^0$ (Linear pairs of angles)

$68^0 + a = 180^0$

$a = 180^0 - 68^0$

$a = 112^0$

(ii) The pairs of vertically opposite angles are,

∠AOC and ∠BOD and ∠BOC and ∠AOD

(iii) The pairs of adjacent angles are,

∠AOC and ∠BOC, ∠BOC and ∠BOD, ∠BOD and ∠DOA, ∠DOA and ∠AOC

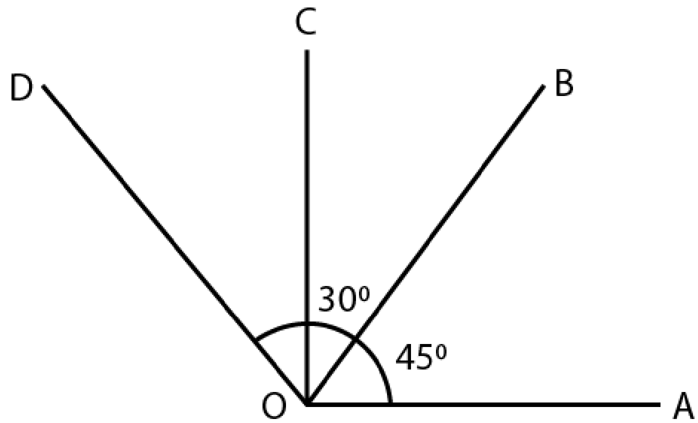
(iv) The reflex angles in the given figure are,

∠BOC and ∠DOA,

Reflex angle BOC $= 180^0 + 68^0$

$= 248^0$
Reflex angle DOA $= 180^0 + 68^0$
$= 248^0$

13. In the given figure:
(i) If $\angle AOB = 45^0$, $\angle BOC = 30^0$ and $\angle AOD = 110^0$;
Find: angles COD and BOD
(ii) If $\angle BOC = \angle DOC = 34^0$ and $\angle AOD = 120^0$;
Find: angle AOB and angle AOC
(iii) If $\angle AOB = \angle BOC = \angle COD = 38^0$
Find: reflex angle AOC and reflex angle AOD



Solution:
(i) $\angle COD = \angle AOD - \angle AOC$
$= \angle AOD - (\angle AOB + \angle BOC)$
$= 110^0 - (45^0 + 30^0)$
We get,
$= 110^0 - 75^0$
$= 35^0$
Hence,
$\angle COD = 35^0$
$\angle BOD = \angle BOC + \angle COD$
$= 30^0 + 35^0$
$= 65^0$
Hence,
$\angle BOD = 65^0$
(ii) $\angle AOB = \angle AOD - \angle BOD$
$= \angle AOD - (\angle BOC + \angle COD)$
$= 120^0 - (34^0 + 34^0)$
We get,

$= 120^0 - 68^0$
$= 52^0$
Hence,
$\angle AOB = 52^0$
$\angle AOC = \angle AOB + \angle BOC$
$= 52^0 + 34^0$
$= 86^0$
Hence,
$\angle AOC = 86^0$
(iii) Reflex angel AOC = $360^0 - \angle AOC$
$= 360^0 - (\angle AOB + \angle BOC)$
$= 360^0 - (38^0 + 38^0)$
$= 360^0 - 76^0$
We get,
$= 284^0$
Hence,
$\angle AOC = 284^0$
Reflex angle AOD = $360^0 - \angle AOD$
$= 360^0 - (\angle AOB + \angle BOC + \angle COD)$
$= 360^0 - (38^0 + 38^0 + 38^0)$
$= 360^0 - 114^0$
We get,
$= 246^0$
Hence,
$\angle AOC = 246^0$

EXERCISE 24(B)

1. Write the complement angle of:

(i) 45^0

(ii) x^0

(iii) $(x – 10)^0$

(iv) $20^0 + y^0$

Solution:

(i) The complement angle of 45^0 is,

$= 90^0 - 45^0$

$= 45^0$

Therefore, the complement angle of 45^0 is 45^0

(ii) x^0

The complement angle of x^0 is,

$= 90^0 – x^0$

$= (90 – x)^0$

Therefore, the complement angle of x^0 is $(90 – x)^0$

(iii) The complement angle of $(x – 10)^0$ is,

$= 90^0 – (x – 10)^0$

$= 90^0 – x^0 + 10^0$

$= 100^0 – x^0$

$= (100 – x)^0$

Therefore, the complement of $(x – 10)^0$ is $(100 – x)^0$

(iv) The complement angle of $20^0 + y^0$ is,

$= 90^0 – (20^0 + y^0)$

$= 90^0 – 20^0 – y^0$

We get,

$= 70^0 – y^0$

$= (70 – y)^0$

2. Write the supplement angle of:

(i) 49^0

(ii) 111^0

(iii) $(x – 30)^0$

(iv) $20^0 + y^0$

Solution:

(i) The supplement angle of 49^0 is,

$= 180^0 - 49^0$

$= 131^0$

Hence, the supplement angle of 49^0 is 131^0

(ii) The supplement angle of 111^0 is,
= $180^0 - 111^0$
= 69^0
Hence, the supplement angle of 111^0 is 69^0
(iii) The supplement angle of $(x – 30)^0$ is,
= $180^0 – (x – 30)^0$
= $180^0 – x^0 + 30^0$
= $210^0 – x^0$
= $(210 – x)^0$
Hence, the supplement angle of $(x – 30)^0$ is $(210 – x)^0$
(iv) The supplement angle of $20^0 + y^0$ is,
= $180^0 – (20^0 + y^0)$
= $180^0 – 20^0 – y^0$
= $160^0 – y^0$
= $(160 – y)^0$
Hence, the supplement angle of $20^0 + y^0$ is $(160 – y)^0$

3. Write the complement angle of:
(i) 1 / 2 of 60^0
(ii) 1 / 5 of 160^0
(iii) 2 / 5 of 70^0
(iv) 1 / 6 of 90^0
Solution:
(i) The complement angle of (1 / 2 of 60^0) is,
= $90^0 – (1 / 2 \times 60^0)$
We get,
= $90^0 – 30^0$
= 60^0
Therefore, the complement angle of (1 / 2 of 60^0) is 60^0
(ii) The complement angle of (1 / 5 of 160^0) is,
= $90^0 – (1 / 5 \times 160^0)$
We get,
= $90^0 – 32^0$
= 58^0
Therefore, the complement angle of (1 / 5 of 160^0) is 58^0
(iii) The complement angle of (2 / 5 of 70^0) is,
= $90^0 – (2 / 5 \times 70^0)$
We get,
= $90^0 - 28^0$

$= 62^0$
Therefore, the complement of ($2 / 5$ of 70^0) is 62^0
(iv) The complement angle of ($1 / 6$ of 90^0) is,
$= 90^0 – (1 / 6 \times 90^0)$
We get,
$= 90^0 - 15^0$
$= 75^0$
Therefore, the complement of ($1 / 6$ of 90^0) is 75^0

4.
(i) 50% of 120^0
(ii) $1 / 3$ of 150^0
(iii) 60% of 100^0
(iv) $3 / 4$ of 160^0
Solution:
(i) Supplement angle of 50% of 120^0 is,
$= 180^0 – (50\% \text{ of } 120^0)$
$= 180^0 – [(120^0 \times 50) / 100]$
We get,
$= 180^0 - 60^0$
$= 120^0$
Hence, supplement angle of 50% of 120^0 is 120^0
(ii) Supplement angle of ($1 / 3$ of 150^0) is,
$= 180^0 – (1 / 3 \times 150^0)$
We get,
$= 180^0 - 50^0$
$= 130^0$
Hence, supplement angle of ($1 / 3$ of 150^0) is 130^0
(iii) Supplement angle of 60% of 100^0 is,
$= 180^0 – (60\% \text{ of } 100^0)$
$= 180^0 – [(60 \times 100) / 100]$
We get,
$= 180^0 - 60^0$
$= 120^0$
Hence, the supplement angle of (60% of 100^0) is 120^0
(iv) Supplement angle of $3 / 4$ of 160^0
$= 180^0 – (3 / 4 \text{ of } 160^0)$
We get,
$= 180^0 - 120^0$

$= 60^0$

Hence, the supplement angle of ($3 / 4$ of 160^0) is 60^0

5. Find the angle:

(i) that is equal to its complement?

(ii) that is equal to its supplement?

Solution:

(i) The angle equal to its complement is 45^0

(ii) The angle equal to its supplement is 90^0

6. Two complementary angles are in the ratio 7: 8. Find the angles

Solution:

Given

Two complementary angles are in the ratio 7: 8

Let the two complementary angles be 7x and 8x

Hence,

$7x + 8x = 90^0$

$15x = 90^0$

We get,

$x = 90^0 / 15$

$x = 6^0$

So, two complementary angles are

$7x = 7 \times 6^0$

$= 42^0$

$8x = 8 \times 6^0$

$= 48^0$

Therefore, two complementary angles are 42^0 and 48^0

7. Two supplementary angles are in the ratio 7: 11. Find the angles

Solution:

Given

Two supplementary angles are in the ratio 7: 11

Let the two supplementary angles be 7x and 11x

Hence,

$7x + 11x = 180^0$

$18x = 180^0$

$x = 180^0 / 18$

We get,

$x = 10^0$

So, two supplementary angles are
$7x = 7 \times 10^0$
$= 70^0$
$11x = 11 \times 10^0$
$= 110^0$
Therefore, two supplementary angles are 70^0 and 110^0

8. The measures of two complementary angles are $(2x - 7)^0$ and $(x + 4)^0$. Find x.
Solution:
Given
$(2x - 7)^0$ and $(x + 4)^0$ are two complementary angles
We know that,
Sum of two complementary angles = 90^0
Hence,
$(2x - 7)^0 + (x + 4)^0 = 90^0$
$2x - 7 + x + 4 = 90^0$
$3x - 3 = 90^0$
$3x = 90^0 + 3^0$
$3x = 93^0$
$x = 93^0 / 3$
We get,
$x = 31^0$
Therefore, the value of $x = 31^0$

9. The measures of two supplementary angles are $(3x + 15)^0$ and $(2x + 5)^0$. Find x.
Solution:
Given
$(3x + 15)^0$ and $(2x + 5)^0$ are two supplementary angles
We know that,
Sum of two supplementary angles = 180^0
Hence,
$(3x + 15)^0 + (2x + 5)^0 = 180^0$
$3x + 15 + 2x + 5 = 180^0$
$5x + 20^0 = 180^0$
$5x = 180^0 - 20^0$
$5x = 160^0$
$x = 160^0 / 5$
We get,
$x = 32^0$

Therefore, the value of x is 32^0

10. For an angle x^0, find:
(i) the complementary angle
(ii) the supplementary angle
(iii) the value of x^0 if its supplementary angle is three times its complementary angle.
Solution:
For an angle x^0
(i) Complementary angle of x^0 is,
$= (90^0 – x)$
(ii) Supplementary angle of x^0 is,
$= (180^0 – x)$
(iii) As per the statement,
Supplementary angle = 3 (Complementary angle)
$180^0 – x = 3 (90^0 – x)$
$180^0 – x = 270^0 – 3x$
$- x + 3x = 270^0 – 180^0$
$2x = 90^0$
$x = 90^0 / 2$
We get,
$x = 45^0$
Therefore, the value of x is 45^0