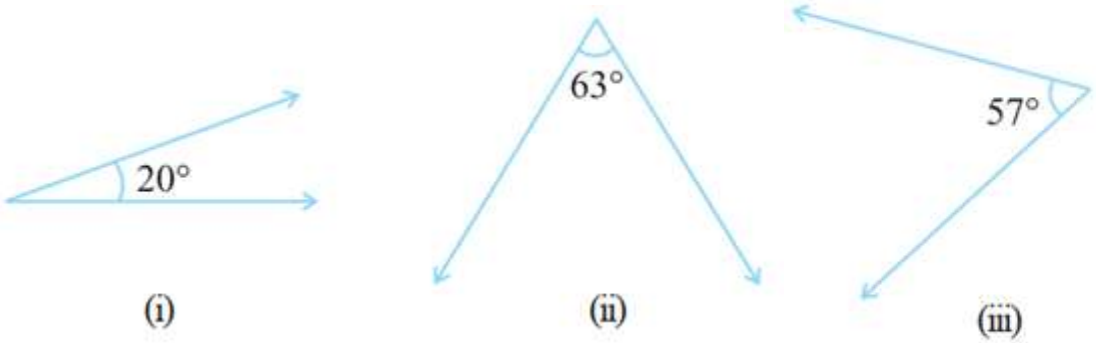
Lines and Angles: Exercise 5.1

Q.1 Find the complement of each of the following angles:

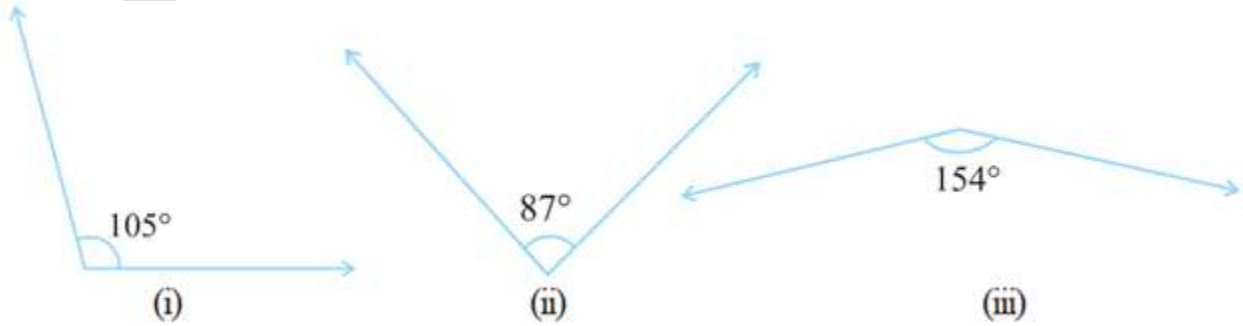


Sol: Since, sum of the complementary angles are 90°.
(i) Given: Measure of given angle = 20°
Let x^o be the complement of the given angle.
So, $20^o + x^o = 90^o$
$x^o = 90^o - 20^o$
$x^o = 70^o$
Thus, the complement of the given angle is 70°.

(ii) Given: Measure of given angle = 63°
Let x^o be the complement of the given angle.
So, $63^o + x^o = 90^o$
$x^o = 90^o - 63^o$
$x^o = 27^o$
Thus, the complement of the given angle is 27°.

(iii) Given: Measure of given angle = 57°
Let x^o be the complement of the given angle.
So, $57^o + x^o = 90^o$
$x^o = 90^o - 57^o$
$x^o = 33^o$
Thus, the complement of the given angle is 33°.

Q.2 Find the supplement of each of the following angles:



Sol: Since, sum of the supplementary angles are 180°
(i) Given: Measure of given angle = 105°
Let x^o be the supplement of the given angle.

So, $105^o + x^o = 180^o$
$x^o = 180^o - 105^o$
$x^o = 75^o$
Thus, the supplement of the given angle is 75^o.

(ii) Given: Measure of given angle = 87^o
Let x^o be the supplement of the given angle.
So, $87^o + x^o = 180^o$
$x^o = 180^o - 87^o$
$x^o = 93^o$
Thus, the supplement of the given angle is 83^o.

(iii) Given: Measure of given angle = 154^o
Let x^o be the supplement of the given angle.
So, $154^o + x^o = 180^o$
$x^o = 180^o - 154^o$
$x^o = 26^o$
Thus, the supplement of the given angle is 26^o.

Q.3 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**
Sol: Firstly we need to add the both given angles.

(i) Given measure of angles: 65^o, 115^o
Sum of the given two angles: $65^o + 115^o = 180^o$
Since, Sum of the given angles is 180^o. So, these angles are supplementary angles.

(ii) Given measure of angles: 63^o, 27^o
Sum of the given two angles: $63^o + 27^o = 90^o$
Since, Sum of the given angles is 90^o. So, these angles are complementary angles.

(iii) Given measure of angles: 112^o, 68^o
Sum of the given two angles: $112^o + 68^o = 180^o$
Since, Sum of the given angles is 180^o. So, these angles are supplementary angles.

(iv) Given measure of angles: 130^o, 50^o
Sum of the given two angles: $130^o + 50^o = 180^o$
Since, Sum of the given angles is 180^o. So, these angles are supplementary angles.

(v) Given measure of angles: 45^o, 45^o
Sum of the given two angles: $45^o + 45^o = 90^o$
Since, Sum of the given angles is 90^o. So, these angles are complementary angles.

(vi) Given measure of angles: 80^o, 10^o
Sum of the given two angles: $80^o + 10^o = 90^o$
Since, Sum of the given angles is 90^o. So, these angles are complementary angles.

Q.4 Find the angle which is equal to its complement.

Sol: Let x^o be the required angle.

Since, angle is equal to its complement and sum of measures of complementary angle pair is 90^o.

So,

$x + x = 90^o$

$2x = 90^o$

$x = 90/2$

$x = 45^o$

Thus, the required angle measures = 45^o

Q.5 Find the angle which is equal to its supplement.

Sol: Let x^o be the the required angle.

Since, angle is equal to its supplement and sum of measures of supplementary angle pair is 180^o.

So,

$x^o + x^o = 180^o$

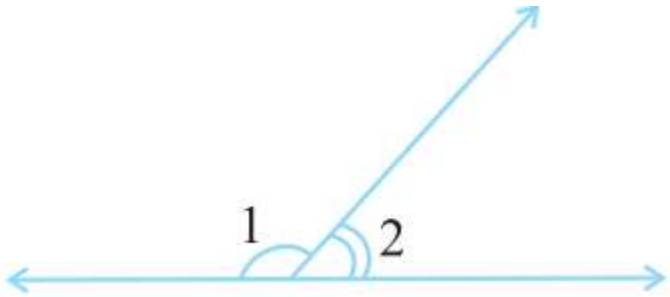
$2\ x^o = 180^o$

$x^o = 180/2$

$x^o = 90^o$

Thus, the required angle = 90^o

Q.6 In the given figure, 1 and 2 are supplementary angles. If 1 is decreased, what changes should take place in 2 so that both the angles still remain supplementary.



Sol: **Given:** ∠1 and ∠2 are supplementary angles.

If ∠1 is decreased, then ∠2 will be increased by the same value. Thus, these angle pair remains supplementary.

Q.7 Can two angles be supplementary if both of them are:

(i) Acute? (ii) Obtuse? (iii) Right?

Sol: Since, sum of the supplementary angles is 180^o.

(i) No, two angles cannot be supplementary if both of them are Acute angle. Since both acute angles are less than 90^o and their sum will be less than 90^o.

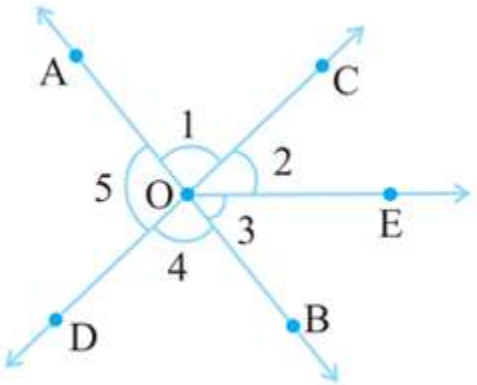
(ii) No, two angles cannot be supplementary if both of them are Obtuse angle. Since both obtuse angles are more than 90^o and their sum will be more than 180^o.

(iii) Yes, two angles can be supplementary if both of them are right angle. Since, both right angles are 90^o and their sum will be 180^o.

Q.8 An angle is greater than 45°. Is its complementary angle greater than 45° or equal to 45° or less than 45°?

Sol: Let $\angle x$ and $\angle y$ be the complementary angles,
Since, sum of complementary angles is 90°.
So,
$\angle x + \angle y = 90^\circ$
According to question, $\angle x > 45^\circ$
On adding $\angle y$ on both the sides,
$\angle x + \angle y > 45^\circ + \angle y$
$90^\circ > 45^\circ + \angle y$
$90^\circ - 45^\circ > \angle y$
$\angle y < 45^\circ$
Thus, its complementary angle is less than 45°.

Q.9 In the adjoining figure:
(i) Is ∠1 adjacent to ∠2?
(ii) Is ∠AOC adjacent to ∠AOE?
(iii) Do ∠COE and ∠EOD form a linear pair?
(iv) Are ∠BOD and ∠DOA supplementary?
(v) Is ∠1 vertically opposite to ∠4?
(vi) What is the vertically opposite angle of ∠5?



Sol:
(i) In given figure, ∠ 1 and ∠ 2 have common vertex O and side OA is their common side. Their non-common arms OA and OE are on both the side of common arm OA. So, ∠1 is adjacent to ∠2.

(ii) From the figure, ∠ AOC and ∠ AOE have common vertex O and side OA is their common side. But their non-common arms are not on the both side of common arms OA. So, ∠ AOC is not adjacent to ∠ AOE.

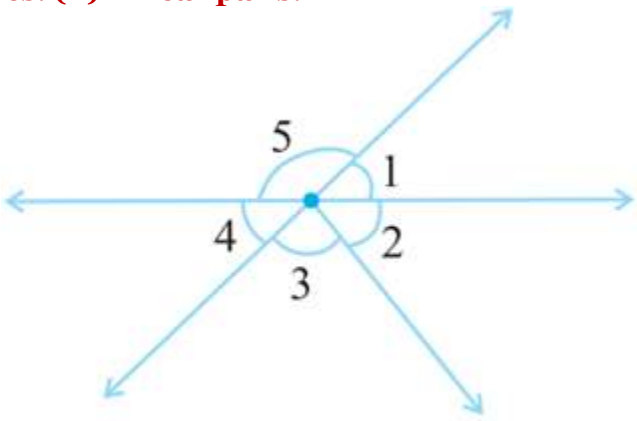
(iii) From the figure, ∠COE and ∠EOD have common vertex O and side OE is their common side. Their non-common arms OC and OD are on both the side of common arm OE. Both the angles on a straight line ∠COD. So, COE and ∠EOD form a linear pair.

(iv) In given figure, ∠BOD and ∠DOA have common vertex O and side OD is their common side. Their non-common arms OB and OA are opposite to each other. So, ∠BOD and ∠DOA are supplementary.

(v) In given figure, ∠1 and ∠2 are formed by the intersection of two straight lines AOB and COD. So, ∠1 is vertically opposite to ∠4.

(vi) In the given figure, two straight lines AB and CD intersect each other at point O and form ∠5 and ∠ COB. So, ∠5 and ∠ COB are vertically opposite angles.

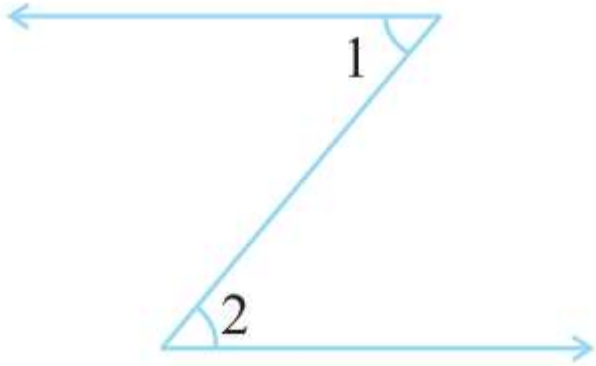
Q.10 Indicate which pairs of angles are:
(i) Vertically opposite angles. (ii) Linear pairs.



Sol:
(i) Vertically opposite angles.
Since, two angles are formed by the intersection of two straight lines, called vertically opposite angles.
So, vertically opposite angles:
$\angle 1$ and $\angle 4$,
$\angle 5$ and $\angle 2 + \angle 3$

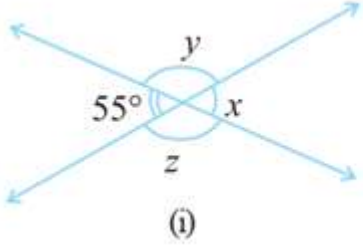
(ii) Linear pairs.
Since, angles having a common vertex and also having non common arms opposite to each other are called linear pairs.
So, linear pairs angles:
$\angle 1$ and $\angle 5$,
$\angle 5$ and $\angle 4$

Q.11 In the following figure, is $\angle 1$ adjacent to $\angle 2$? Give reasons.

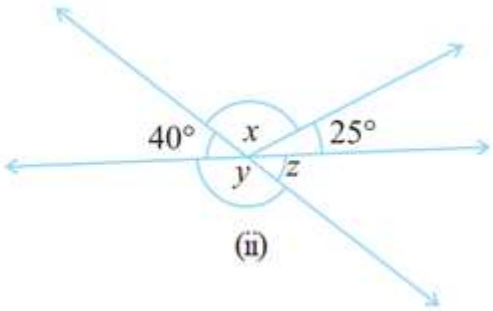


Sol: In given figure, $\angle 1$ and $\angle 2$ are not adjacent angles. Since, they are not lie on the common vertex.

Q.12 Find the values of the angles x, y, and z in each of the following:



(i)



(ii)

Sol:
(i) From the figure,

$\angle x = 55^o$, (Since, vertically opposite angles)

$\angle x + \angle y = 180^o$ ... (Since, sum of linear pair angles is 180^o)

$55^o + \angle y = 180^o$

$\angle y = 180^o - 55^o$

$\angle y = 125^o$

And $\angle y = \angle z$ ... (Since, vertically opposite angles)

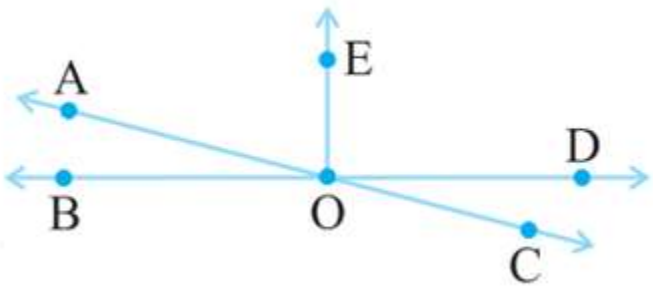
So, $\angle z = 125^o$

Thus, $\angle x = 55^o$, $\angle y = 125^o$ and $\angle z = 125^o$.

(ii) From the figure, $\angle z = 40^o$ (Since, vertically opposite angles)
$\angle y + \angle z = 180^o$ ... (Since, linear pair)
$\angle y + 40^o = 180^o$
$\angle y = 180^o - 40^o$
$\angle y = 140^o$
Then, $40^o + \angle x + 25^o = 180^o$ ... (Since, sum of angles on straight line is 180^o)
$65^o + \angle x = 180^o$
$\angle x = 180^o - 65^o$
So, $\angle x = 115^o$
Thus, $\angle x = 115^o$, $\angle y = 140^o$ and $\angle z = 40^o$.

Q.13 (i) If two angles are complementary, then the sum of their measures is _____.
(ii) If two angles are supplementary, then the sum of their measures is _____.
(iii) Two angles forming a linear pair are _____.
(iv) If two adjacent angles are supplementary, they form a _____.
(v) If two lines intersect at a point, then the vertically opposite angles are always_____.
(vi) If two lines intersect at a point, and if one pair of vertically opposite angles are acute angles, then the other pair of vertically opposite angles are _____.
Sol: (i) If two angles are complementary, then the sum of their measures is **90°**.
(ii) If two angles are supplementary, then the sum of their measures is **180°**.
(iii) Two angles forming a linear pair are **Supplementary**.
(iv) If two adjacent angles are supplementary, they form a **linear pair**.
(v) If two lines intersect at a point, then the vertically opposite angles are always **equal**.
(vi) If two lines intersect at a point, and if one pair of vertically opposite angles are acute angles, then the other pair of vertically opposite angles are **Obtuse angles.**

Q.14 In the adjoining figure, name the following pairs of angles.



(i) Obtuse vertically opposite angles
(ii) Adjacent complementary angles
(iii) Equal supplementary angles
(iv) Unequal supplementary angles
(v) Adjacent angles that do not form a linear pair
Sol:
(i) Obtuse vertically opposite angles: ∠BOC and ∠AOD
(ii) Adjacent complementary angles: ∠AOB and ∠AOE
(iii) Equal supplementary angles: ∠EOB and EOD
(iv) Unequal supplementary angles: ∠EOA and ∠EOC
(v) Adjacent angles that do not form a linear pair: ∠AOB and ∠AOE, ∠AOE and ∠EOD, ∠EOD and ∠COD.