

EXERCISE 14A

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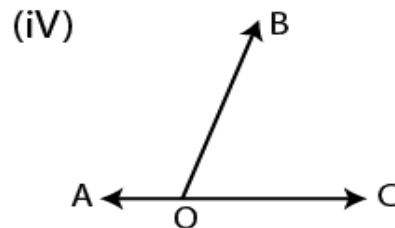
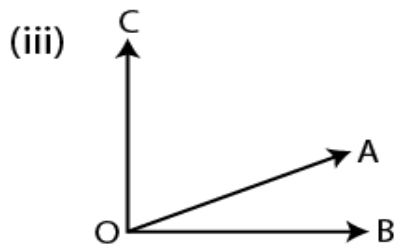
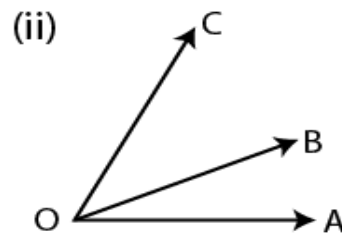
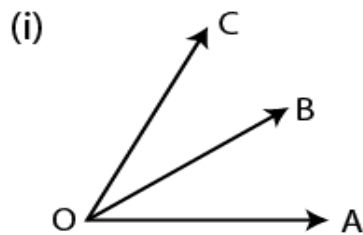
**1. State, true or false:**

- (i) A line segment 4 cm long can have only 2000 points in it.  
(ii) A ray has one end point and a line segment has two end-points.  
(iii) A line segment is the shortest distance between any two given points.  
(iv) An infinite number of straight lines can be drawn through a given point.  
(v) Write the number of end points in  
(a) a line segment  $\overline{AB}$  (b) a ray  $\overrightarrow{AB}$  (c) a line  $\overleftrightarrow{AB}$   
(vi) Out of  $\overleftrightarrow{AB}$ ,  $\overrightarrow{AB}$ ,  $\overleftarrow{AB}$  and  $\overline{AB}$  which one has a fixed length?  
(vii) How many rays can be drawn through a fixed point O?  
(viii) How many lines can be drawn through three  
(a) collinear points?  
(b) non-collinear points?  
(ix) Is  $40^\circ$  the complement of  $60^\circ$ ?  
(x) Is  $45^\circ$  the supplement of  $45^\circ$ ?

**Solution:**

- (i) False.  
It contains infinite number of points.
- (ii) True.
- (iii) True.
- (iv) True.
- (v) (a) 2 (b) 1 (c) 0
- (vi)  $\overline{AB}$  has fixed length.
- (vii) Infinite rays can be drawn through a fixed point O.
- (viii) (a) 1 line can be drawn through three collinear points.  
(b) 3 lines can be drawn through three non-collinear points.
- (ix) False.  
 $40^\circ$  is the complement of  $50^\circ$  as  $40^\circ + 50^\circ = 90^\circ$
- (x) False.  
 $45^\circ$  is the supplement of  $135^\circ$  not  $45^\circ$ .

**2. In which of the following figures, are  $\angle AOB$  and  $\angle AOC$  adjacent angles? Give, in each case, reason for your answer.**



**Solution:**

If  $\angle AOB$  and  $\angle AOC$  are adjacent angle, they have  $OA$  as their common arm.

(i) From the figure

$OB$  is the common arm

$\angle AOB$  and  $\angle AOC$  are not adjacent angles.

(ii) From the figure

$OC$  is the common arm

$\angle AOB$  and  $\angle AOC$  are not adjacent angles.

(iii) From the figure

$OA$  is the common arm

$\angle AOB$  and  $\angle AOC$  are adjacent angles.

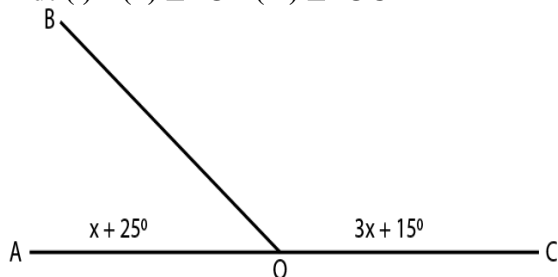
(iv) From the figure

$OB$  is the common arm

$\angle AOB$  and  $\angle AOC$  are not adjacent angles.

**3. In the given figure,  $BAC$  is a straight line.**

**Find:** (i)  $x$  (ii)  $\angle AOB$  (iii)  $\angle BOC$



**Solution:**

We know that

$\angle AOB$  and  $\angle COB$  are linear pairs

It can be written as

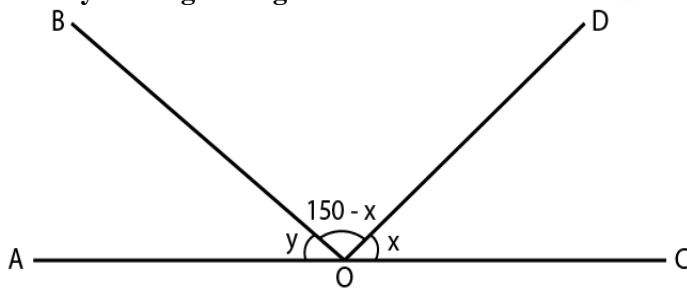
$\angle AOB + \angle COB = 180^\circ$   
 Substituting the values  
 $x + 25^\circ + 3x + 15^\circ = 180^\circ$   
 By further calculation  
 $4x + 40^\circ = 180^\circ$   
 So we get  
 $4x = 180 - 40 = 140^\circ$

(i)  $x = 140/4 = 35^\circ$

(ii)  $\angle AOB = x + 25$   
 Substituting the value of  $x$   
 $\angle AOB = 25 + 35 = 60^\circ$

(iii)  $\angle BOC = 3x + 15^\circ$   
 Substituting the value of  $x$   
 $\angle BOC = (3 \times 35) + 15$   
 $\angle BOC = 120^\circ$

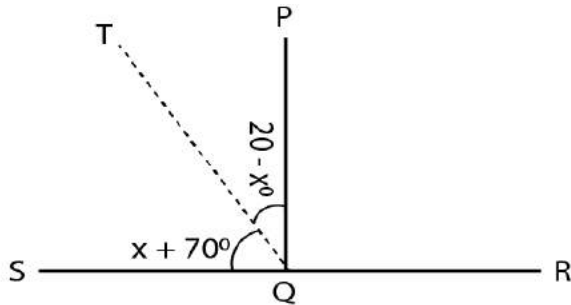
**4. Find  $y$  in the given figure.**



**Solution:**

Here AOC is a straight line  
 We can write it as  
 $\angle AOB + \angle BOD + \angle DOC = 180^\circ$   
 Substituting the values  
 $y + 150 - x + x = 180$   
 By further calculation  
 $y + 150 = 180$   
 So we get  
 $y = 180 - 150 = 30^\circ$

**5. In the given figure, find  $\angle PQR$ .**



**Solution:**

Here SQR is a straight line

We can write it as

$$\angle SQT + \angle TQP + \angle PQR = 180^\circ$$

Substituting the values

$$x + 70 + 20 - x + \angle PQR = 180^\circ$$

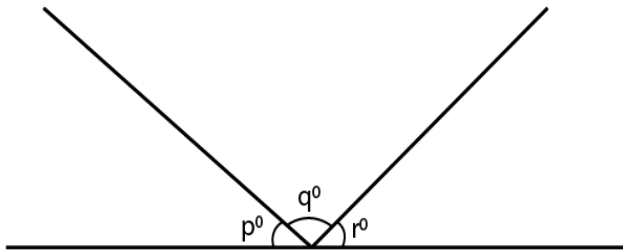
By further calculation

$$90^\circ + \angle PQR = 180^\circ$$

So we get

$$\angle PQR = 180^\circ - 90^\circ = 90^\circ$$

**6. In the given figure,  $p^\circ = q^\circ = r^\circ$ , find each.**



**Solution:**

We know that

$$p^\circ + q^\circ + r^\circ = 180^\circ \text{ is a straight angle}$$

It is given that

$$p^\circ = q^\circ = r^\circ$$

We can write it as

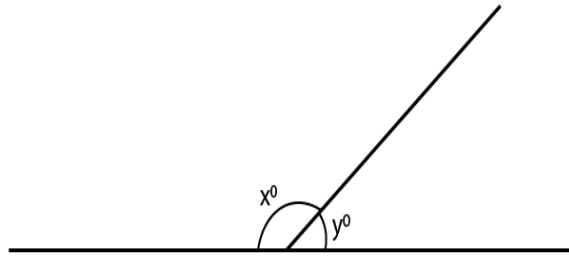
$$p^\circ + p^\circ + p^\circ = 180^\circ$$

$$3p = 180$$

$$p = 180/3 = 60^\circ$$

Therefore,  $p^\circ = q^\circ = r^\circ = 60^\circ$

**7. In the given figure, if  $x = 2y$ , find  $x$  and  $y$ .**



**Solution:**

It is given that

$$x = 2y$$

For a straight angle

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

Substituting the values

$$2y + y = 180$$

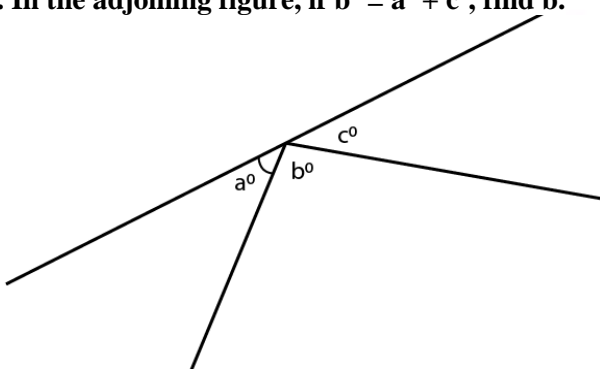
By further calculation

$$3y = 180$$

$$y = 180/3 = 60^\circ$$

$$x = 2y = 2 \times 60^\circ = 120^\circ$$

**8. In the adjoining figure, if  $b^\circ = a^\circ + c^\circ$ , find b.**



**Solution:**

It is given that

$$b^\circ = a^\circ + c^\circ$$

For a straight angle

$$a^\circ + b^\circ + c^\circ = 180^\circ$$

Substituting the values

$$b^\circ + b^\circ = 180^\circ$$

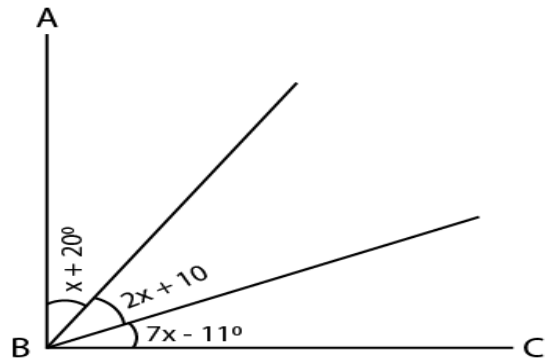
$$2b^\circ = 180^\circ$$

$$b^\circ = 180/2 = 90^\circ$$

**9. In the given figure, AB is perpendicular to BC at B.**

**Find : (i) the value of x.**

**(ii) the complement of angle x.**



**Solution:**

(i) From the figure

$AB \perp BC$  at B

Here  $\angle ABC = 90^\circ$

Substituting the values

$$x + 20 + 2x + 10 + 7x - 11 = 90$$

By further calculation

$$10x + 10 = 90$$

$$10x = 90 - 10 = 80$$

$$x = 80/10 = 8^\circ$$

(ii) The complement of angle  $x = 90 - x$

So we get

$$= 90 - 8 = 82^\circ$$

**10. Write the complement of:**

(i)  $25^\circ$

(ii)  $90^\circ$

(iii)  $a^\circ$

(iv)  $(x + 5)^\circ$

(v)  $(30 - a)^\circ$

(vi)  $\frac{1}{2}$  of a right angle

(vii)  $\frac{1}{3}$  of  $180^\circ$

(viii)  $21^\circ 17'$

**Solution:**

(i) The complement of  $25^\circ = 90^\circ - 25^\circ = 65^\circ$

(ii) The complement of  $90^\circ = 90^\circ - 90^\circ = 0$

(iii) The complement of  $a^\circ = 90^\circ - a^\circ$

(iv) The complement of  $(x + 5)^\circ = 90^\circ - (x + 5)^\circ$

By further calculation

$$= 90^\circ - x - 5^\circ$$

$$= 85^\circ - x$$

(v) The complement of  $(30 - a)^\circ = 90^\circ - (30 - a)^\circ$

By further calculation  
 $= 90^\circ - 30^\circ + a^\circ$   
 $= 60^\circ + a^\circ$

(vi) The complement of  $\frac{1}{2}$  of a right angle  $= 90^\circ - \frac{1}{2}$  of a right angle  
So we get  
 $= 90^\circ - \frac{1}{2} \times 90^\circ$   
 $= 90^\circ - 45^\circ$   
 $= 45^\circ$

(vii) The complement of  $\frac{1}{3}$  of  $180^\circ = 90^\circ - \frac{1}{3}$  of  $180^\circ$   
By further calculation  
 $= 90^\circ - 60^\circ$   
 $= 30^\circ$

(viii) The complement of  $21^\circ 17' = 90^\circ - 21^\circ 17'$   
So we get  
 $= 68^\circ 43'$

**11. Write the supplement of:**

- (i)  $100^\circ$
- (ii)  $0^\circ$
- (iii)  $x^\circ$
- (iv)  $(x + 35)^\circ$
- (v)  $(90 + a + b)^\circ$
- (vi)  $(110 - x - 2y)^\circ$
- (vii)  $\frac{1}{5}$  of a right angle
- (viii)  $80^\circ 49' 25''$

**Solution:**

(i) The supplement of  $100^\circ = 180 - 100 = 80^\circ$

(ii) The supplement of  $0^\circ = 180 - 0 = 180^\circ$

(iii) The supplement of  $x^\circ = 180^\circ - x^\circ$

(iv) The supplement of  $(x + 35)^\circ = 180^\circ - (x + 35)^\circ$   
We can write it as  
 $= 180 - x - 35$   
 $= 145^\circ - x^\circ$

(v) The supplement of  $(90 + a + b)^\circ = 180^\circ - (90 + a + b)^\circ$   
We can write it as  
 $= 180 - 90 - a - b$   
So we get  
 $= 90^\circ - a^\circ - b^\circ$   
 $= (90 - a - b)^\circ$

(vi) The supplement of  $(110 - x - 2y)^\circ = 180^\circ - (110 - x - 2y)^\circ$   
We can write it as

$$= 180 - 110 + x + 2y$$
$$= 70^\circ + x^\circ + 2y^\circ$$

(vii) The supplement of  $1/5$  of a right angle  $= 180^\circ - 1/5$  of a right angle

We can write it as

$$= 180^\circ - 1/5 \times 90^\circ$$

So we get

$$= 180^\circ - 18^\circ$$

$$= 162^\circ$$

(viii) The supplement of  $80^\circ 49' 25'' = 180^\circ - 80^\circ 49' 25''$

We know that  $1^\circ = 60'$  and  $1' = 60''$

So we get

$$= 99^\circ 10' 35''$$

**12. Are the following pairs of angles complementary?**

(i)  $10^\circ$  and  $80^\circ$

(ii)  $37^\circ 28'$  and  $52^\circ 33'$

(iii)  $(x + 16)^\circ$  and  $(74 - x)^\circ$

(iv)  $54^\circ$  and  $2/5$  of a right angle.

**Solution:**

(i)  $10^\circ$  and  $80^\circ$

Yes, they are complementary angles as their sum  $= 10^\circ + 80^\circ = 90^\circ$

(ii)  $37^\circ 28'$  and  $52^\circ 33'$

No, they are not complementary angles as their sum is not equal to  $90^\circ$

$$37^\circ 28' + 52^\circ 33' = 90^\circ 1'$$

(iii)  $(x + 16)^\circ$  and  $(74 - x)^\circ$

Yes, they are complementary angles as their sum  $= x + 16 + 74 - x = 90^\circ$

(iv)  $54^\circ$  and  $2/5$  of a right angle

We can write it as

$$= 54^\circ \text{ and } 2/5 \times 90^\circ$$

$$= 54^\circ \text{ and } 36^\circ$$

Yes, they are complementary angles as their sum  $= 54 + 36 = 90^\circ$

**13. Are the following pairs of angles supplementary?**

(i)  $139^\circ$  and  $39^\circ$

(ii)  $26^\circ 59'$  and  $153^\circ 1'$

(iii)  $3/10$  of a right angle and  $4/15$  of two right angles

(iv)  $2x^\circ + 65^\circ$  and  $115^\circ - 2x^\circ$

**Solution:**

(i)  $139^\circ$  and  $39^\circ$

No, they are not supplementary angles as their sum is not equal to  $180^\circ$

$$139^\circ + 39^\circ = 178^\circ$$

(ii)  $26^\circ 59'$  and  $153^\circ 1'$



Yes, they are supplementary angles as their sum =  $26^{\circ}59' + 153^{\circ}1' = 180^{\circ}$

(iii)  $3/10$  of a right angle and  $4/15$  of two right angles

We can write it as

$$= 3/10 \text{ of } 90^{\circ} \text{ and } 4/15 \text{ of } 180^{\circ}$$

$$= 27^{\circ} \text{ and } 48^{\circ}$$

No, they are not supplementary angles as their sum is not equal to  $180^{\circ}$

$$27^{\circ} + 48^{\circ} = 75^{\circ}$$

(iv)  $2x^{\circ} + 65^{\circ}$  and  $115^{\circ} - 2x^{\circ}$

Yes they are supplementary angles as their sum =  $2x + 65 + 115 - 2x = 180^{\circ}$

**14. If  $3x + 18^{\circ}$  and  $2x + 25^{\circ}$  are supplementary, find the value of x.**

**Solution:**

It is given that  $3x + 18^{\circ}$  and  $2x + 25^{\circ}$  are supplementary

We can write it as

$$3x + 18^{\circ} + 2x + 25^{\circ} = 180^{\circ}$$

By further calculation

$$5x + 43^{\circ} = 180^{\circ}$$

So we get

$$5x = 180 - 43 = 137^{\circ}$$

$$x = 137/5 = 27.4^{\circ} \text{ or } 27^{\circ} 24'$$

**15. If two complementary angles are in the ratio 1:5, find them.**

**Solution:**

It is given that two complementary angles are in the ratio 1:5

Consider x and 5x as the angles

We can write it as

$$x + 5x = 90^{\circ}$$

$$6x = 90^{\circ}$$

So we get

$$x = 90/6 = 15^{\circ}$$

Here the angles will be  $15^{\circ}$  and  $15 \times 5 = 75^{\circ}$