EXERCISE 14A

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 AB (b) a ray AB (c) a line 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° the complement of 60°?
(x) Is 45° the supplement of 45°?
Solution:

(i) False.
It contains infinite number of points.

(ii) True.

(iii) True.

(iv) True.

(v) (a) 2 (b) 1 (c) 0

(vi) AB has fixed length.

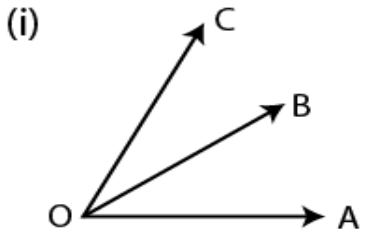
(vii) Infinite rays can be drawn through a fixed point O.

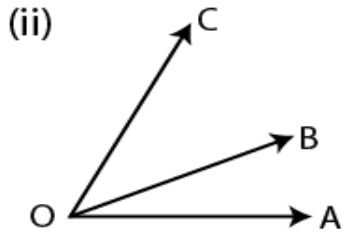
(viii) (a) 1 line can be drawn through three collinear points.
(b) 3 lines can be drawn through three non-collinear points.

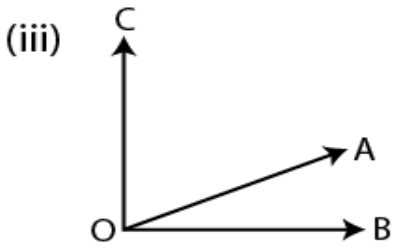
(ix) False.
40^o is the complement of 50^o as $40^o + 50^o = 90^o$

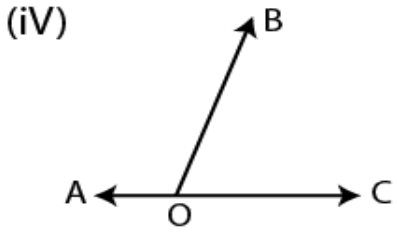
(x) False.
45^o is the supplement of 135^o not 45^o.

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









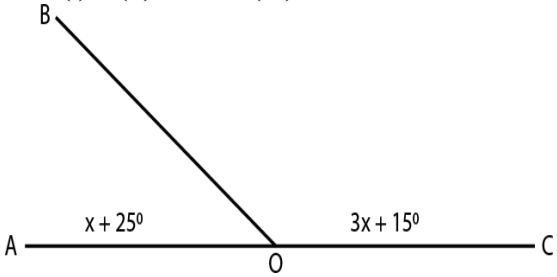
Solution:

If ∠AOB and ∠AOC are adjacent angle, they have OA as their common arm.
(i) From the figure
OB is the common arm
∠AOB and ∠AOC are not adjacent angles.
(ii) From the figure
OC is the common arm
∠AOB and ∠AOC are not adjacent angles.

(iii) From the figure
OA is the common arm
∠AOB and ∠AOC are adjacent angles.

(iv) From the figure
OB is the common arm
∠AOB and ∠AOC are not adjacent angles.

3. In the given figure, B AC is a straight line.
Find: (i) x (ii) ∠AOB (iii) ∠BOC



Solution:

We know that
∠AOB and ∠COB are linear pairs
It can be written as

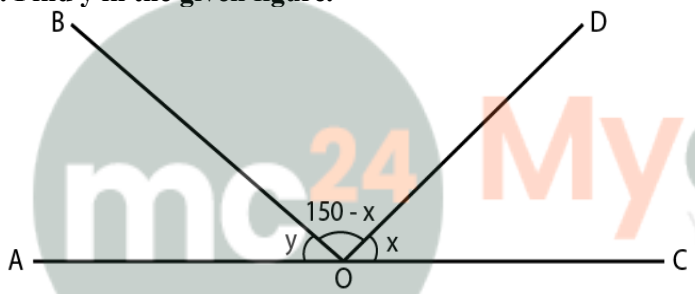
∠AOB + ∠COB = 180º
Substituting the values
x + 25º + 3x + 15º = 180º
By further calculation
4x + 40º = 180º
So we get
4x = 180 – 40 = 140º

(i) x = 140/4 = 35º

(ii) ∠AOB = x + 25
Substituting the value of x
∠AOB = 25 + 35 = 60º

(iii) ∠BOC = 3x + 15º
Substituting the value of x
∠BOC = (3 × 35) + 15
∠BOC = 120º

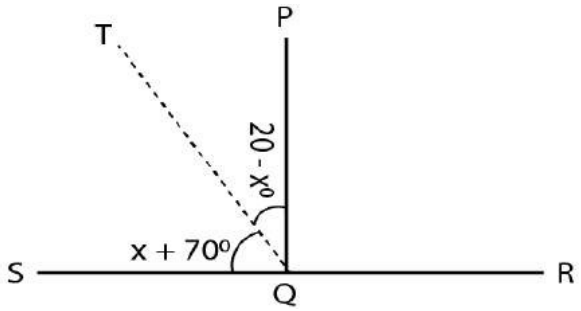
4. Find y in the given figure.



Solution:

Here AOC is a straight line
We can write it as
∠AOB + ∠BOD + ∠DOC = 180º
Substituting the values
y + 150 – x + x = 180
By further calculation
y + 150 = 180
So we get
y = 180 – 150 = 30º

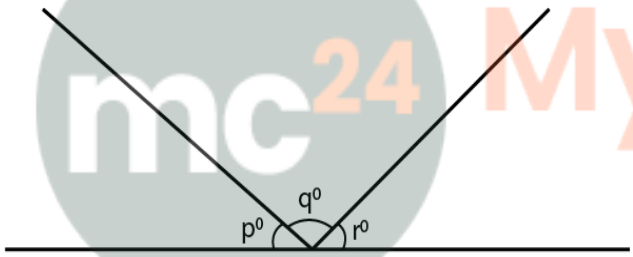
5. In the given figure, find ∠PQR.



Solution:

Here SQR is a straight line
We can write it as
$\angle SQT + \angle TQP + \angle PQR = 180^o$
Substituting the values
$x + 70 + 20 – x + \angle PQR = 180^o$
By further calculation
$90^o + \angle PQR = 180^o$
So we get
$\angle PQR = 180^o – 90^o = 90^o$

6. In the given figure, $p^o = q^o = r^o$, find each.

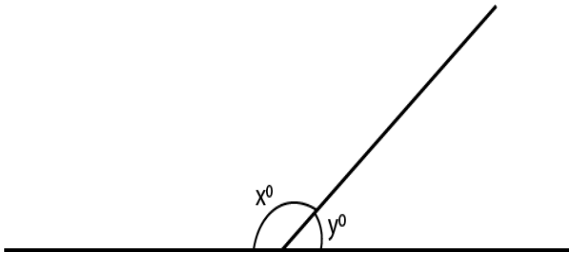


Solution:

We know that
$p^o + q^o + r^o = 180^o$ is a straight angle
It is given that
$p^o = q^o = r^o$
We can write it as
$p^o + p^o + p^o = 180^o$
$3p = 180$
$p = 180/3 = 60^o$

Therefore, $p^o = q^o = r^o = 60^o$

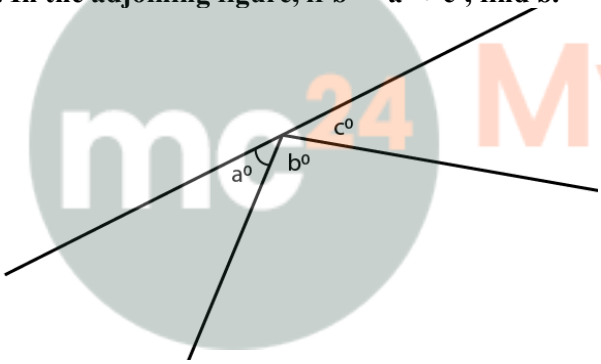
7. In the given figure, if x = 2y, find x and y.



Solution:

It is given that
$x = 2y$
For a straight angle
$x^o + y^o = 180^o$
Substituting the values
$2y + y = 180$
By further calculation
$3y = 180$
$y = 180/3 = 60^o$
$x = 2y = 2 \times 60^o = 120^o$

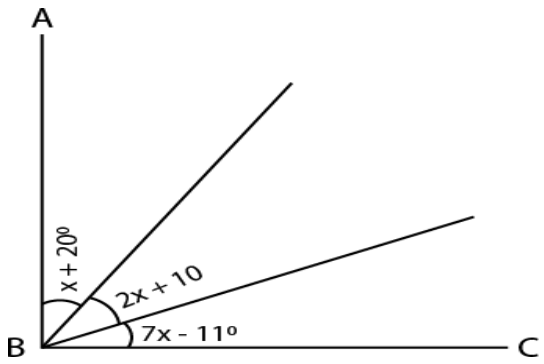
8. In the adjoining figure, if $b^o = a^o + c^o$, find b.



Solution:

It is given that
$b^o = a^o + c^o$
For a straight angle
$a^o + b^o + c^o = 180^o$
Substituting the values
$b^o + b^o = 180^o$
$2b^o = 180^o$
$b^o = 180/2 = 90^o$

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 || BC at B
Here ∠ABC = 90°
Substituting the values
x + 20 + 2x + 1 + 7x – 11 = 90
By further calculation
10x + 10 = 90
10x = 90 – 10 = 80
x = 80/10 = 8°

(ii) The complement of angle x = 90 – x
So we get
= 90 – 8 = 82°

10. Write the complement of:
(i) 25°
(ii) 90°
(iii) a°
(iv) (x + 5)°
(v) (30 – a)°
(vi) ½ of a right angle
(vii) 1/3 of 180°
(viii) 21° 17'
Solution:

(i) The complement of 25° = 90° – 25° = 65°

(ii) The complement of 90° = 90° – 90° = 0

(iii) The complement of a° = 90° - a°

(iv) The complement of (x + 5)° = 90° – (x + 5)°
By further calculation
= 90° – x – 5°
= 85° – x

(v) The complement of (30 – a)° = 90° – (30 – a)°

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

(vi) The complement of ½ of a right angle = 90^o – ½ of a right angle
So we get
$= 90^o - ½ \times 90^o$
$= 90^o - 45^o$
$= 45^o$

(vii) The complement of 1/3 of 180^o = 90^o – 1/3 of 180^o
By further calculation
$= 90^o - 60^o$
$= 30^o$

(viii) The complement of 21^o 17’ = 90^o - 21^o 17’
So we get
= 68^o 43’

11. Write the supplement of:
(i) 100°
(ii) 0°
(iii) x°
(iv) (x + 35)°
(v) (90 +a + b)°
(vi) (110 – x – 2y)°
(vii) 1/5 of a right angle
(viii) 80° 49′ 25″
Solution:

(i) The supplement of 100° = 180 – 100 = 80^0

(ii) The supplement of 0° = 180 – 0 = 180^o

(iii) The supplement of x° = $180^0 - x^0$

(iv) The supplement of (x + 35)° = $180^0 - (x + 35)^0$
We can write it as
$= 180 - x - 35$
$= 145^0 - x^0$

(v) The supplement of (90 + a + b)° = $180^0 - (90 + a + b)^0$
We can write it as
$= 180 - 90 - a - b$
So we get
$= 90^0 - a^0 - b^0$
$= (90 - a - b)^0$

(vi) The supplement of (110 – x – 2y)° = 180^0 – (110 – x – 2y)°
We can write it as

$= 180 – 110 + x + 2y$
$= 70^0 + x^0 + 2y^0$

(vii) The supplement of 1/5 of a right angle = 180^0 – 1/5 of a right angle
We can write it as
$= 180^0 – 1/5 \times 90^0$
So we get
$= 180^0 - 18^0$
$= 162^0$

(viii) The supplement of 80° 49′ 25″ = 180^0 - 80° 49′ 25″
We know that 1^0 = 60’ and 1’ = 60”
So we get
$= 99^0$ 10’ 35”

12. Are the following pairs of angles complementary?
(i) 10° and 80°
(ii) 37° 28′ and 52° 33′
(iii) (x+ 16)°and (74 - x)°
(iv) 54° and 2/5 of a right angle.
Solution:

(i) 10° and 80°
Yes, they are complementary angles as their sum = $10^0 + 80^0 = 90^0$

(ii) 37° 28′ and 52° 33′
No, they are not complementary angles as their sum is not equal to 90^0
37° 28′ + 52° 33′ = $90^0$1’

(iii) (x+ 16)° and (74 - x)°
Yes, they are complementary angles as their sum = $x + 16 + 74 – x = 90^0$

(iv) 54° and 2/5 of a right angle
We can write it as
$= 54^0$ and $2/5 \times 90^0$
$= 54^0$ and 36^0
Yes, they are complementary angles as their sum = $54 + 36 = 90^0$

13. Are the following pairs of angles supplementary?
(i) 139º and 39º
(ii) 26º59’ and 153º1’
(iii) 3/10 of a right angle and 4/15 of two right angles
(iv) $2x^0 + 65^0$ and $115^0 – 2x^0$
Solution:

(i) 139º and 39º
No, they are not supplementary angles as their sum is not equal to 180^0
$139^0 + 39^0 = 178^0$

(ii) 26º59’ and 153º1’

Yes, they are supplementary angles as their sum = $26°59' + 153°1' = 180^0$

(iii) 3/10 of a right angle and 4/15 of two right angles
We can write it as
= 3/10 of 90^0 and 4/15 of 180^0
= 27^0 and 48^0
No, they are not supplementary angles as their sum is not equal to 180^0

$27^0 + 48^0 = 75^0$

(iv) $2x^o + 65^o$ and $115^o - 2x^o$
Yes they are supplementary angles as their sum = $2x + 65 + 115 - 2x = 180^0$

14. If 3x + 18° and 2x + 25° are supplementary, find the value of x.
Solution:

It is given that 3x + 18° and 2x + 25° are supplementary
We can write it as
$3x + 18° + 2x + 25° = 180^0$
By further calculation
$5x + 43^0 = 180^0$
So we get
$5x = 180 - 43 = 137^0$
$x = 137/5 = 27.4^0$ or $27^0\ 24'$

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
$x + 5x = 90^0$
$6x = 90^0$
So we get
$x = 90/6 = 15^0$
Here the angles will be 15^0 and $15 \times 5 = 75^0$