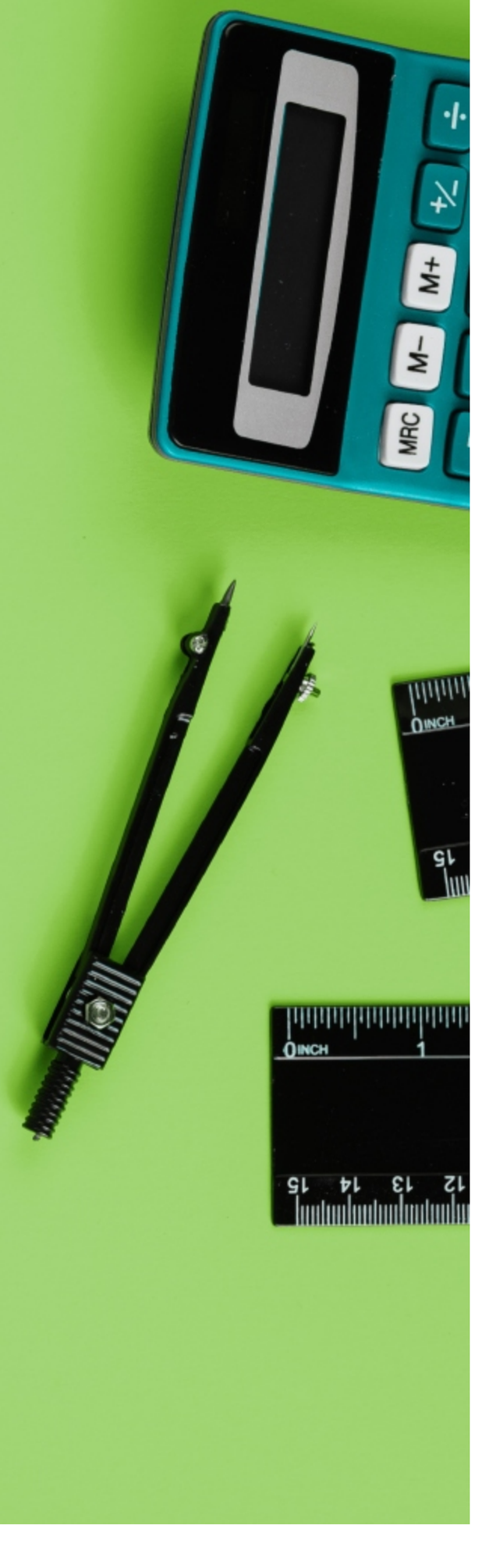
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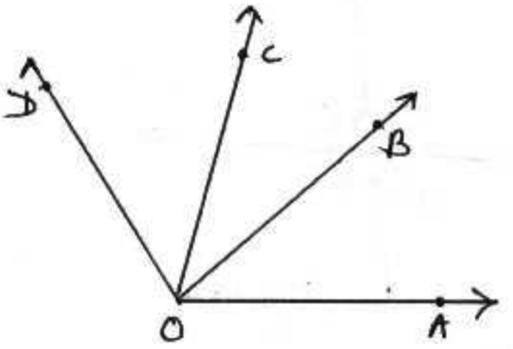


Ch-14

Lines and Angles

Exercise 14.1

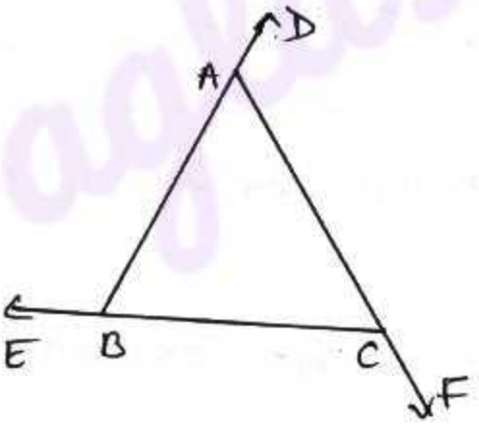
Q.1 Write down each pair of adjacent angles shown in figure 13.



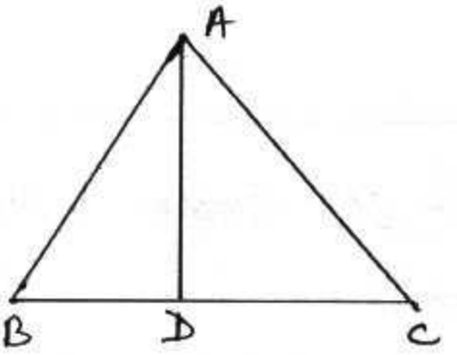
Solution: pair of adjacent angles are

$(\angle AOB, \angle BOC)$ $(\angle BOC, \angle COD)$ $(\angle AOB, \angle BOD)$ $(\angle AOC, \angle COD)$

Q.2 In fig 14, name all the pairs of adjacent angles.



(i)



(ii)

Solution: In fig (i) adjacent angles are.

$(\angle EBA, \angle ABC)$, $(\angle ACB, \angle BCF)$ $(\angle BAC, \angle CAD)$

In fig (ii) adjacent angles are

$(\angle ADB, \angle ADC)$ $(\angle BAD, \angle DAC)$

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Q.3 In fig 15, Write down (i) each linear pair (ii) each pair of vertically opposite angles.

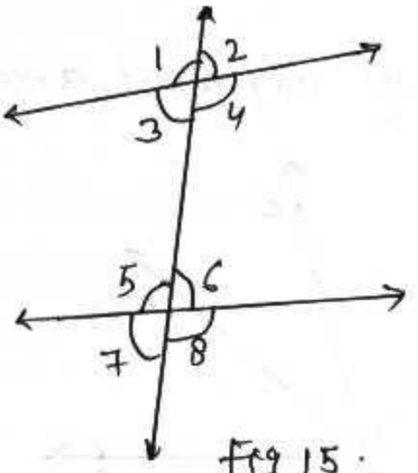


Fig 15.

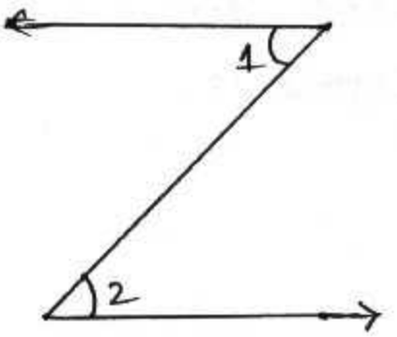


Fig. 16

Solution: (i) Linear pair = $(\angle 1, \angle 2)$ $(\angle 2, \angle 4)$, $(\angle 3, \angle 4)$, $(\angle 1, \angle 3$ $(\angle 5, \angle 6)$ $(\angle 6, \angle 8)$ $(\angle 8, \angle 7)$ $(\angle 5, \angle 7)$

(ii) Vertically opposite angles = $(\angle 1, \angle 4)$ $(\angle 2, \angle 3)$ $(\angle 5, \angle 8)$ $(\angle 6, \angle 7)$

Q.4 Are the angles 1 and 2 given in fig 16 adjacent angles?

Sol: No, as angle 1 and 2 have no common vertex.

Q.5 Find the complement of each of the following angles:

(i) 35° (ii) 72° (iii) 45° (iv) 85°

Solution (i) Complement of $35^\circ = 90 - 35^\circ = 55^\circ$

(ii) Complement of $72^\circ = 90^\circ - 72^\circ = 18^\circ$

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(iii) Complement of $45^\circ = 90^\circ - 45^\circ = 45^\circ$

(iv) Complement of $85^\circ = 90^\circ - 85^\circ = 5^\circ$

Q6 Find the supplement of each of the following angles

(i) 70° (ii) 120° (iii) 135° (iv) 90°

Solution (i) Supplement of $70^\circ = 180^\circ - 70^\circ = 110^\circ$

(ii) Supplement of $120^\circ = 180 - 120^\circ = 60^\circ$

(iii) Supplement of $135^\circ = 180^\circ - 135^\circ = 45^\circ$

(iv) Supplement of $90^\circ = 180^\circ - 90^\circ = 90^\circ$

Q7 Identify the complementary and supplementary pairs of angles from the following pairs:

(i) $25^\circ, 65^\circ$ (ii) $120^\circ, 60^\circ$ (iii) $63^\circ, 27^\circ$ (iv) $100^\circ, 80^\circ$

Solution (i) $25^\circ + 65^\circ = 90^\circ$

$\therefore$ $25^\circ, 65^\circ$ are complementary angles.

(ii) $120^\circ + 60^\circ = 180^\circ$, $\therefore$ $120^\circ, 60^\circ$ are supplementary angles

(iii) $63^\circ + 27^\circ = 90^\circ$, these are complementary angles.

(iv) $100^\circ + 80^\circ = 180^\circ$, these are supplementary angles.

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Q8 Can two angles be supplementary, if both of them be

(i) obtuse ? (ii) right ? (iii) acute ?

Solution : (i) obtuse : sum of two obtuse angles is greater than 180°.

∴ Two obtuse angles can not be supplementary.

(ii) ∵ Angles Measures 90° is a right angle.

also 90° + 90° = 180°

∴ sum of two right angles is 180°

hence two right angles are always supplementary

(iii) An angle measures between 0° and 90° are called acute angles.

∴ sum of two acute angles is less than 180°.

hence two acute angles can not be supplementary.

Q.9 Name the four pairs of supplementary angles shown in fig 17.

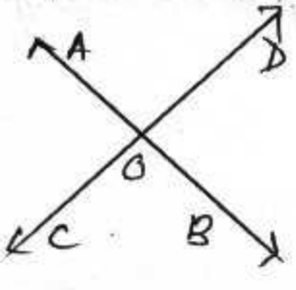


Fig 17

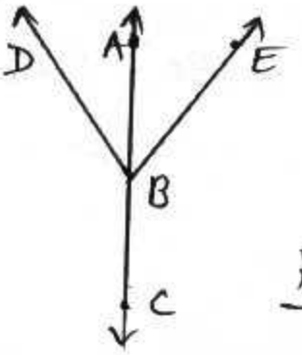


Fig 18

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Solution: Pair of supplementary angles:

$(\angle AOD, \angle DOB)$ $(\angle DOB, \angle BOC)$, $(\angle BOC, \angle AOC)$

$(\angle AOC, \angle AOD)$

Q.10 In fig. 18, A, B, C are collinear points and

$\angle DBA = \angle EBA$

(I) Name two linear pairs

(II) Name two pairs of supplementary angles.

Solution: (I) Linear pair = $(\angle ABD, \angle CBD)$, $(\angle ABE, \angle CBE)$

(II) Supplementary angles: $(\angle ABD, \angle CBD)$ $(\angle ABE, \angle CBE)$

Q.11 If two supplementary angles have equal measure, what is the measure of each angle?

Solution: $\because$ Sum of two supplementary angles $= 180°$.

Then, Measure of each angle $= \frac{180°}{2} = 90°$

Q.12 If the complement of an angle is 28°, then find the supplement of the angle?

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Solution : If complement of $28° = x$

Then $x + 28° = 90°$

$\Rightarrow x = 90° - 28° = 62°$

$\therefore$ Supplement of $62° = 180 - 62°$

$= 118°$

Q.13 In fig 19, name each linear pair and each pair of vertically opposite angles.

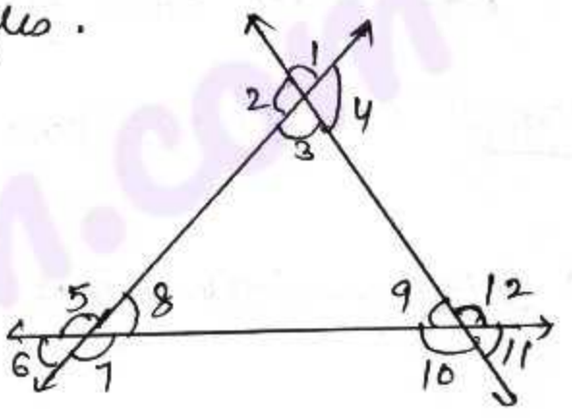


Fig. 19

Solution :

Linear pair of angles :

$(\angle 1, \angle 2)$ $(\angle 2, \angle 3)$ $(\angle 3, \angle 4)$, $(\angle 1, \angle 4)$

$(\angle 5, \angle 6)$ $(\angle 6, \angle 7)$ $(\angle 7, \angle 8)$, $(\angle 5, \angle 8)$

$(\angle 9, \angle 10)$ $(\angle 10, \angle 11)$ $(\angle 11, \angle 12)$, $(\angle 9, \angle 12)$

Pair of vertically opposite angles : $(\angle 1, \angle 3)$ $(\angle 2, \angle 4)$

$(\angle 5, \angle 7)$ $(\angle 6, \angle 8)$, $(\angle 9, \angle 11)$ $(\angle 10, \angle 12)$

Q14 In fig. 20, OE is the bisector of $\angle BOD$. If $\angle 1 = 70°$ find the magnitude of $\angle 2$, $\angle 3$ and $\angle 4$.

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Solution:

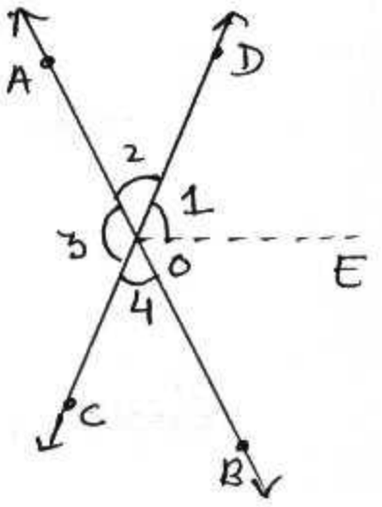


Fig. 20

∵ OE is a bisector of ∠BOD, then

$\angle DOE = \angle BOE$

$\Rightarrow \angle 1 = \angle BOE = 70^\circ$

Now $\angle 1 + \angle BOE + \angle 2 = 180^\circ$

(Angles on straight line)

$\Rightarrow 70^\circ + 70^\circ + \angle 2 = 180^\circ$

$\Rightarrow 140^\circ + \angle 2 = 180^\circ \Rightarrow \angle 2 = 180^\circ - 140^\circ$

$= 40^\circ$

also, $\angle 2 = \angle 4$ (vertically opposite angles)

Then, $\angle 4 = 40^\circ$

∵ $\angle 3 + \angle 4 = 180^\circ$ (linear pair)

$\Rightarrow \angle 3 + 40^\circ = 180^\circ$

$\Rightarrow \angle 3 = 180^\circ - 40 = 140^\circ$

hence, $\angle 2 = 40^\circ$, $\angle 3 = 140^\circ$, $\angle 4 = 40^\circ$

Q.15 One of the angles forming a linear pair is a right angle. What can you say about its other angle.

Solution: Let $\angle A$ and $\angle B$ are linear pair.

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also $\angle A = 90^\circ$

Then $\because \quad \angle A + \angle B = 180^\circ$

$\Rightarrow 90^\circ + \angle B = 180^\circ$

$\Rightarrow \angle B = 180^\circ - 90^\circ = 90^\circ$

Hence, the other angle is also a right angle.

Q.16 One of the angles forming a linear pair is an obtuse angle. What kind of angle is the other?

Solution: If one of the angle of linear pair is obtuse then other will be acute.

Q.17 One of the angle forming a linear pair is an acute angle. What kind of angle is the other.?

Solution: If one angle of linear pair is an acute then, other will be otuse.

Q.18 Can two acute angles form a linear pair?

Solution: No, as sum of two acute angles is less than 180°.

Q.19 If the supplement of an angle is 65°, then find its complement.

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Solution: Let required angle be x, then

$$x + 65^\circ = 180^\circ$$

$$\Rightarrow x = 180 - 65^\circ = 115^\circ.$$

$\because$ Sum of two complementary angles is 90°.

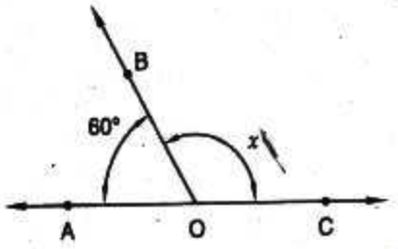
here $115^\circ > 90^\circ$

then complement of 115° can not be determined.

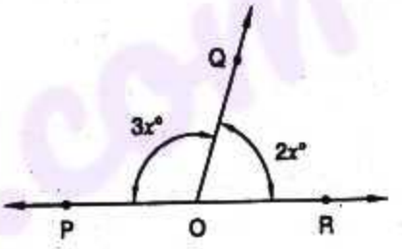
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20. Find the value of x in each of the following figures.

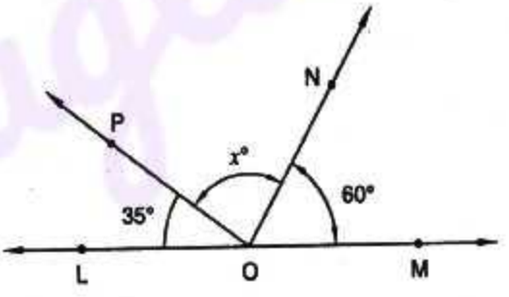
Q. 20



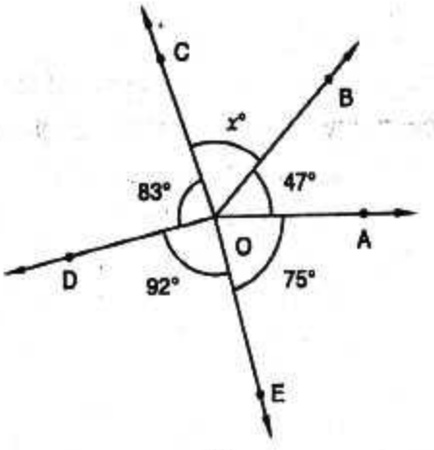
(i)



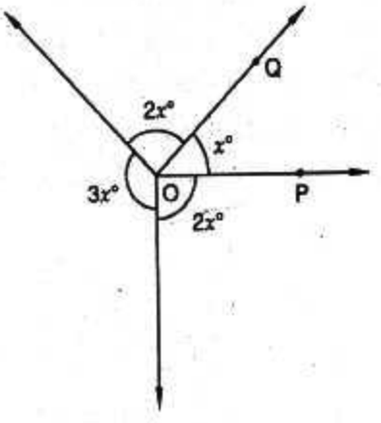
(ii)



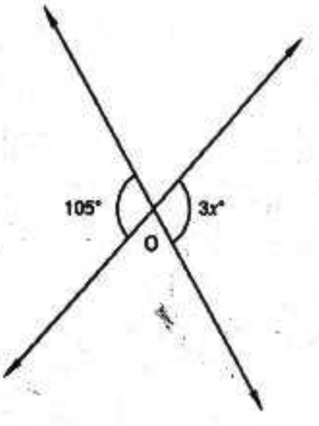
(iii)



(iv)



(v)



(vi)

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Solution

(i) $x^\circ + 60^\circ = 180^\circ$ (linear pair)

$\Rightarrow x = 180^\circ - 60^\circ = 120^\circ$

(ii) $\because 2x + 3x = 180^\circ$ (linear pair)

$\Rightarrow 5x = 180^\circ$

$\Rightarrow x = \frac{180}{5} = 36^\circ$

$\because 2x = 2 \times 36^\circ = 72^\circ$, $3x = 3 \times 36^\circ = 108^\circ$

(iii) $x + 35^\circ + 60^\circ = 180^\circ$ (straight angle)

$\Rightarrow x + 95^\circ = 180^\circ$

$\Rightarrow x = 180^\circ - 95^\circ$

$x = 85^\circ$

(iv) $x^\circ + 83^\circ + 92^\circ + 75^\circ + 47^\circ = 360^\circ$ (complete angle)

$\Rightarrow x^\circ + 297^\circ = 360^\circ$

$\Rightarrow x^\circ = 360^\circ - 297^\circ$

$x^\circ = 63^\circ$

(v) $\because x^\circ + 2x^\circ + 3x^\circ + 2x^\circ = 360^\circ$ (complete angle)

$\Rightarrow 8x^\circ = 360^\circ$

$\Rightarrow x = \frac{360}{8} = 45^\circ$

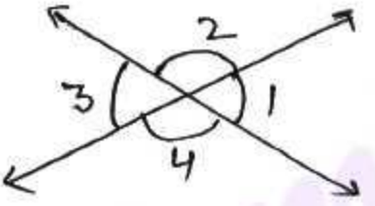
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(vi) $\because \quad 3x^\circ = 105^\circ$ (vertically opposite angles)

$\Rightarrow \quad x = \frac{105^\circ}{3} = 35^\circ$

Q.21 In fig. 22, it being given that $\angle 1 = 65^\circ$, find all other angles.



Solution : It is given that

$\angle 1 = 65^\circ$

$\because \quad \angle 1 = \angle 3$ (vertically opposite angles)

$\Rightarrow \quad \angle 3 = 65^\circ$

also $\angle 1 + \angle 2 = 180^\circ$ (linear pair)

$\Rightarrow \quad 65^\circ + \angle 2 = 180^\circ \quad \Rightarrow \angle 2 = 180^\circ - 65^\circ = 115^\circ$

$\because \quad \angle 2 = \angle 4$ (vertically opposite angles)

$\Rightarrow \quad \angle 4 = 115^\circ$

Hence, $\angle 1 = 65^\circ$, $\angle 2 = 115^\circ$, $\angle 3 = 65^\circ$, $\angle 4 = 115^\circ$.

Q.22 In fig 23, OA and OB are opposite rays :

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

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

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Solution: $3x+2y+5^\circ = 180^\circ$ (linear pair)

$\Rightarrow 3x+2y = 180^\circ - 5^\circ$

$\Rightarrow 3x+2y = 175^\circ$

(i) If $x = 25^\circ$, then $3(25)+2y = 175$

$\Rightarrow 75+2y = 175$

$\Rightarrow 2y = 175-75 = 100$

$\Rightarrow y = \frac{100}{2} = 50^\circ$

(ii) If $y = 35^\circ$, then $3x+2(35) = 175^\circ$

$\Rightarrow 3x+70^\circ = 175^\circ$

$\Rightarrow 3x = 175-70^\circ = 105^\circ$

$\Rightarrow x = \frac{105}{3} = 35^\circ$.

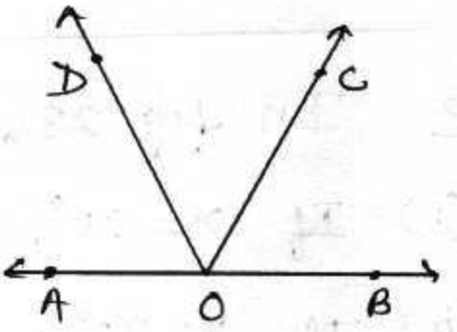
Q23 In fig. 24, write all pairs of adjacent angles and all the linear pairs?

Solution:

Pair of adjacent angles)

(∠BOC, ∠COD) (∠COD, ∠AOD)

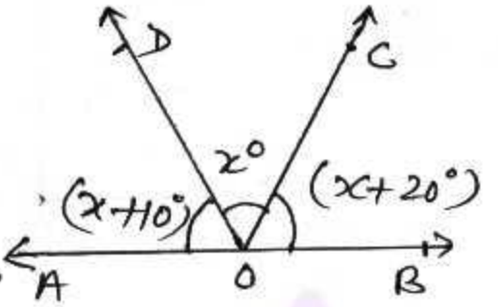
(∠BOD, ∠AOD) (∠AOC, ∠BOC)



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Linear pair: $(\angle AOC, \angle BOC)$ $(\angle AOD, \angle BOD)$

Q.24: In fig. 25, find $\angle x$. Further find $\angle BOC$, $\angle COD$ and $\angle AOD$.



Solution:

$\because (x+10^\circ) + x^\circ + (x+20^\circ) = 180^\circ$

$\Rightarrow 3x^\circ + 30^\circ = 180^\circ$

$\Rightarrow 3x = 180 - 30^\circ = 150^\circ$

$x = \frac{150}{3} = 50^\circ$

Now $\angle BOC = x+20^\circ = 50^\circ + 20^\circ = 70^\circ$

$\angle COD = x^\circ = 50^\circ$

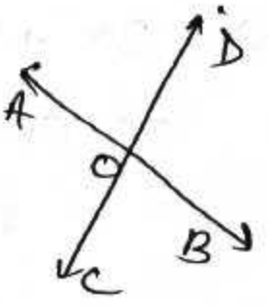
$\angle AOD = x+10^\circ = 50^\circ + 10^\circ = 60^\circ$

Q.25 How many pairs of adjacent angles are formed when two lines intersect at a point?

Solution: Four adjacent angles are formed and they are linear pair.

$(\angle AOD, \angle BOD)$ $(\angle BOD, \angle BOC)$

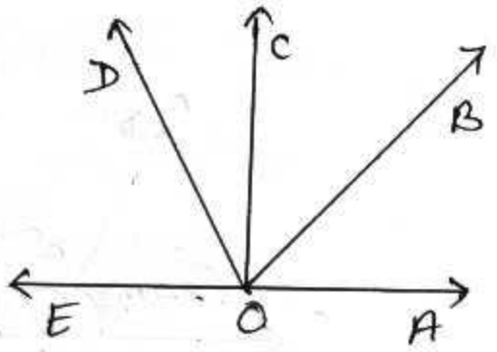
$(\angle BOC, \angle AOC)$ $(\angle AOC, \angle AOD)$



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Q.26 How many pairs of adjacent angles, In all, can you name in fig 26?



Solution: Adjacent angles: (∠EOD, ∠COD) (∠COD, ∠BOC) (∠BOC, ∠AOB), (∠EOD, ∠AOD), (EOC, ∠AOC), (∠EOB, ∠AOB), (∠DOB, ∠AOB), (∠DOC, ∠AOC) (∠BOC, ∠COE) (∠DOE, ∠DOB)

Hence, there are total 10 pair of adjacent angles.

Q.27 In fig. Find the value of x.

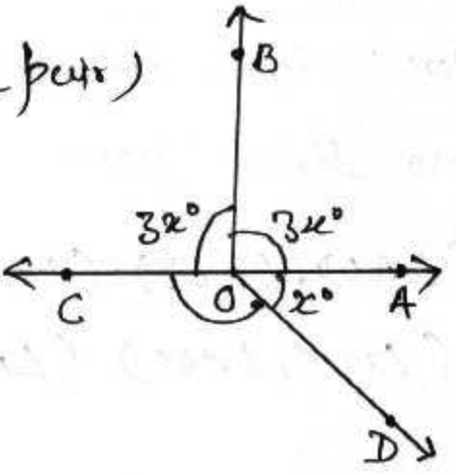
Solution: Here

$\angle AOB + \angle BOC = 180^\circ$ (Linear pair)

$\Rightarrow 3x^\circ + 3x^\circ = 180^\circ$

$\Rightarrow 6x^\circ = 180^\circ$

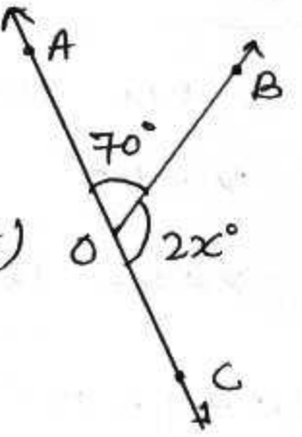
$x = \frac{180}{6} = 30^\circ$



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Q.28 In fig 28, AOC is a line, find x.

Solution:



$\because$ AOC is a line

$\angle AOB + \angle BOC = 180°$ (linear pair)

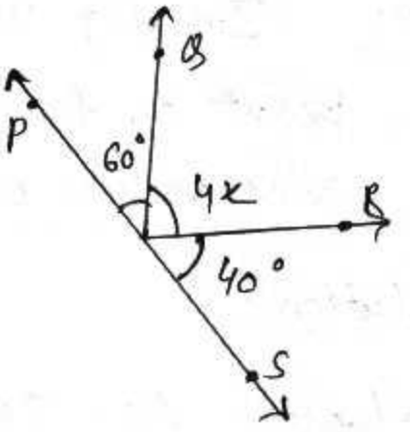
$\Rightarrow 70° + 2x° = 180$

$\Rightarrow 2x° = 180 - 70 = 110°$

$\Rightarrow x = \frac{110°}{2} = 55°$.

Q.29 In fig. 29, POS is a line, find x.

Solution: here



$60° + 4x° + 40° = 180°$

$\Rightarrow 4x + 100° = 180°$

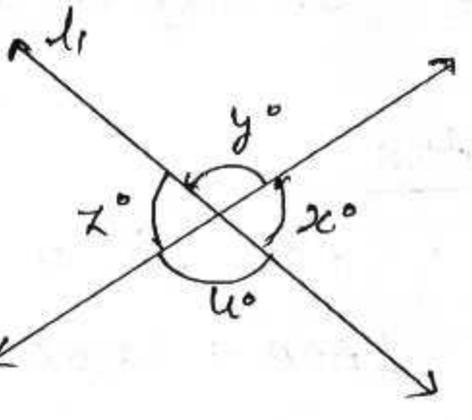
$\Rightarrow 4x = 180° - 100° = 80°$

$\Rightarrow x = \frac{80°}{4} = 20°$

Q.30 In fig 30, lines l_1 and l_2 intersect at O, forming angles as shown in figure. If $x = 45°$, find the values of y, z and u.

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Solution:

Here, we are given that

$x = 45°$

$\because$ $x + y = 180°$ (linear pair)

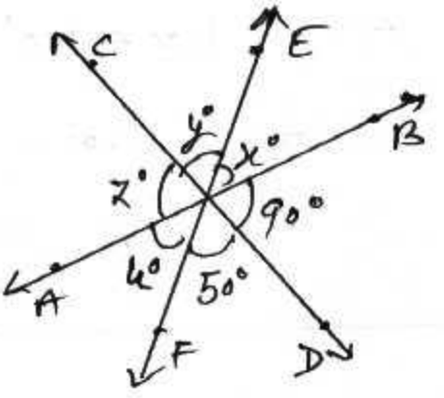
$\Rightarrow$ $45° + y = 180°$

$y = 180° - 45° = 135°$

Now $\because$ $x = z = 45°$ {vertically opposite angles}

$y = u = 135°$

Q.31 In fig 31, three coplaar lines intersect at point O, forming angles as shown in figure. Find the value of x, y, z and u.



Solution:

Here, $\angle z = 90°$ {vertically opp. angles}

$\angle y° = 50°$

also $x + y + 90° = 180°$

$\Rightarrow$ $x + 50° + 90° = 180°$ $(\because y = 50°)$

$\Rightarrow$ $x + 140° = 180°$

$\Rightarrow$ $x = 180 - 140° = 40°$

$\because$ $x° = u°$ (vertically opp. $\angle$s)

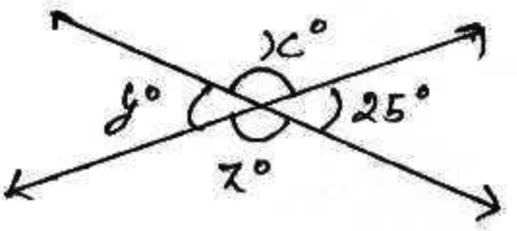
$\Rightarrow$ $u° = 40°$

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Q32 In fig 32, find the values of x, y, z.

Solution:



$\because \quad x^\circ + 25^\circ = 180^\circ$

$\Rightarrow x = 180^\circ - 25^\circ$

$= 155^\circ$

also $\quad x^\circ = z^\circ = 155^\circ$ { vertically opposite angles }

$y^\circ = 25^\circ$

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