4. Angles, Lines and Triangles

Exercise 4A

1. Question

Define the following terms:

(i) Angle

(ii) Interior of an angle

(iii) Obtuse angle

(iv) Reflex angle

(v) Complementary angles

(vi) Supplementary angles

Answer

(i) Angle – A shape formed by two lines or rays diverging from a common vertex.

Types of angle: (a) Acute angle (less than 90°)

(b) Right angle (exactly 90°)

(c) Obtuse angle (between 90° and 180°)

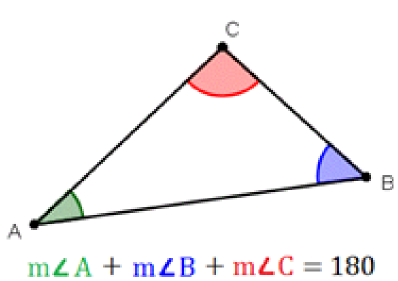
(d) Straight angle (exactly 180°)

(e) Reflex angle (between 180° and 360°)

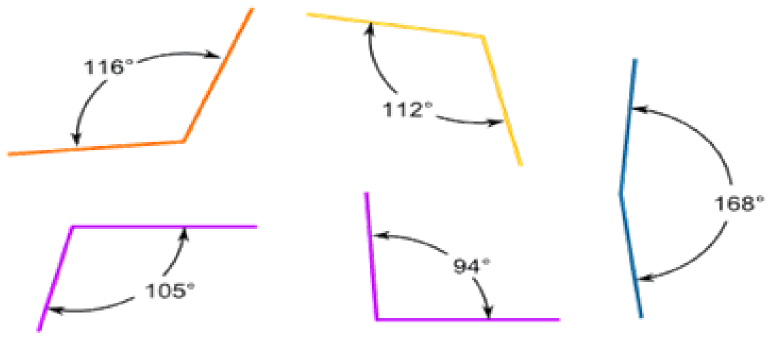
(f) Full angle (exactly 360°)

(ii) Interior of an angle – The area between the rays that make up an angle and extending away from the vertex to infinity.

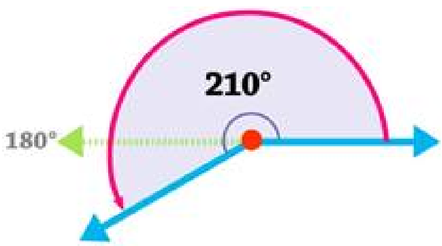
The interior angles of a triangle always add up to 180°.



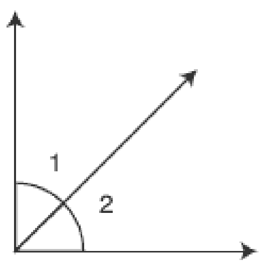
(iii) Obtuse angle – It is an angle that measures between 90 to 180 degrees.



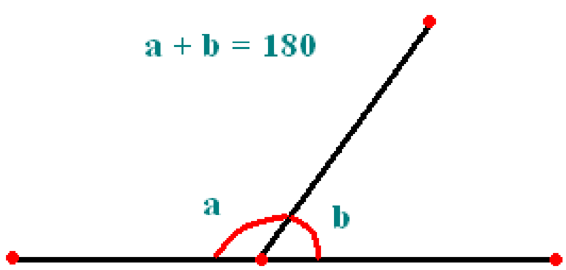
(iv) Reflex angle – It is an angle that measures between 180 to 360 degrees.



(v) Complementary angles – Two angles are called complementary angles if the sum of two angles is 90°.



(vi) Supplementary angles – Angles are said to be supplementary if the sum of two angles is 180°.



2. Question

If $\angle A$ = 36°27′46″and $\angle B$ =28°43′39″, find $\angle A + \angle B$.

Answer

65°11′25′

$\angle A$ + $\angle B$ = 36°27′46″ + 28°43′39″

= 64°70′85″

∵ 60′ = 1° ⇒ 70′ = 1°10′

60″ = 1′ ⇒ 85″ = 1′ 25″

∵ $\angle A$ + $\angle B$ = 65°11′25″

3. Question

Find the difference between two angles measuring 36° and 24°28′30″

Answer

11°31′30″

36° - 24°28′30″ = 35°59′60″ - 24°28′30″

= 11°31′30″

4. Question

Find the complement of each of the following angles.

(i) 58°

(ii) 16°

(iii) $\frac{2}{3}$ of a right angle

(iv) 46°30′

(v) 52°43′20″

(vi) 68°35′45″

Answer

(i) 32°

Complement of angle = 90° – θ

Complement of 58° = 90° - 58°

= 32°

(ii) 74°

Complement of angle = 90° – θ

Complement of 58° = 90° - 16°

= 74°

(iii) 30°

Right angle = 90°

$\frac{2}{3}$ of a right angle = $\frac{2}{3}$ × 90°

= 60°

Complement of 60° = 90° - 60°

= 30°

(iv) 43°30′

Complement of angle = 90° – θ

Complement of 46°30′ = 90° - 46°30′

= 89°60′ - 46°30′

(v) 37°16′40′′

Complement of angle = 90° – θ

Complement of 52°43′20′′ = 90° - 52°43′20′′

= 89°59′60′′ - 52°43′20′′

= 37°16′40′′

(vi) 21°24′15′′

Complement of angle = 90° – θ

Complement of 68°35′45′′ = 90° - 68°35′45′′

= 89°59′60′′ - 68°35′45′′

= 68°35′45′′

5. Question

Find the supplement of each of the following angles.

(i) 63°

(ii) 138°

(iii) $\frac{3}{5}$ of a right angle

(iv) 75°36′

(v) 124°20′40′′

(vi) 108°48′32′′

Answer

(i) 117°

Supplement of angle = 180° – θ

Supplement of 58° = 180° - 63°

= 117°

(ii) 42°

Supplement of angle = 180° – θ

Supplement of 58° = 180° - 138°

= 42°

(iii) 126°

Right angle = 90°

$\frac{3}{5}$ of a right angle = $\frac{3}{5}$ × 90°

= 54°

Supplement of 54° = 180° - 54°

= 126°

(iv) 104°24′

Supplement of angle = 180° – θ

Supplement of 75°36′ = 180° - 75°36′

= 179°60′ - 75°36′

= 104°24′

(v) 55°39′20′′

Supplement of angle = 180° – θ

Supplement of 124°20′40′ = 180° - 124°20′40′′

= 179°59′60″ - 124°20′40′′

= 55°39′20′′

(vi) 71°11′28′′

Supplement of angle = 180° – θ

Supplement of 108°48′32′′ = 180° - 108°48′32′′

= 179°59′60″ - 108°48′32′′

= 71°11′28′′

6. Question

Find the measure of an angle which is

(i) equal to its complement,

(ii) equal to its supplement.

Answer

(i) 45°

Let, measure of an angle = X

Complement of X = 90° – X

Hence,

⇒ X = 90° – X

⇒ 2X = 90°

⇒ X = 45°

Therefore measure of an angle = 45°

(ii) 90°

Let, measure of an angle = X

Supplement of X = 180° – X

Hence,

⇒ X = 180° – X

⇒ 2X = 180°

⇒ X = 90°

Therefore measure of an angle = 90°

7. Question

Find the measure of an angle which is 36° more than its complement.

Answer

63°

Let, measure of an angle = X

Complement of X = 90° – X

According to question,

⇒ X = (90° – X) + 36°

⇒ X + X = 90° + 36°

⇒ 2X = 126°

⇒ X = 63°

Therefore measure of an angle = 63°

8. Question

Find the measure of an angle which 25°less than its supplement.

Answer

(77.5)°

Let, measure of an angle = X

Supplement of X = 180° – X

According to question,

⇒ X = (180° – X) - 25°

⇒ X + X = 180° - 25°

⇒ 2X = 155°

⇒ X = (77.5)°

Therefore measure of an angle = $(77.5)°$

9. Question

Find the angle which is four times its complement.

Answer

$72°$

Let the angle = X

Complement of X = $90° - X$

According to question,

$\Rightarrow X = 4(90° - X)$

$\Rightarrow X = 360° - 4X$

$\Rightarrow X + 4X = 360°$

$\Rightarrow 5X = 360°$

$\Rightarrow X = 72°$

Therefore angle = $72°$

10. Question

Find the angle which is five times its supplement.

Answer

$150°$

Let the angle = X

Supplement of X = $180° - X$

According to question,

$\Rightarrow X = 5(180° - X)$

$\Rightarrow X = 900° - 4X$

$\Rightarrow X + 5X = 900°$

$\Rightarrow 6X = 900°$

$\Rightarrow X = 150°$

Therefore angle = $150°$

11. Question

Find the angle whose supplement is four times its complement.

Answer

$60°$

Let the angle = X

Complement of X = 90° – X

Supplement of X = 180° – X

According to question,

⇒ 180° – X = 4(90° – X)

⇒ 180° – X = 360° – 4X

⇒ – X + 4X = 360° – 180°

⇒ 3X = 180°

⇒ X = 60°

Therefore angle = 60°

12. Question

Find the angle whose complement is four times its supplement.

Answer

180°

Let the angle = X

Complement of X = 90° – X

Supplement of X = 180° – X

According to question,

⇒ 90° – X = 4(180° – X)

⇒ 180° – X = 720° – 4X

⇒ – X + 4X = 720° – 180°

⇒ 3X = 540°

⇒ X = 180°

Therefore angle = 180°

13. Question

Two supplementary angles are in the ratio 3:2 Find the angles.

Answer

108°, 72°

Let angle = X

Supplementary of X = 180° – X

According to question,

X : 180° – X = 3 : 2

⇒ X / (180° – X) = 3 / 2

$\Rightarrow 2X = 3(180° - X)$

$\Rightarrow 2X = 540° - 3X$

$\Rightarrow 2X + 3X = 540°$

$\Rightarrow 5X = 540°$

$\Rightarrow X = 108°$

Therefore angle = 108°

And its supplement = 180° – 108° = 72°

14. Question

Two complementary angles are in the ratio 4:5 Find the angles.

Answer

40°, 50°

Let angle = X

Complementary of X = 90° – X

According to question,

$X : 90° - X = 4 : 5$

$\Rightarrow X / (90° - X) = 4 / 5$

$\Rightarrow 5X = 4(90° - X)$

$\Rightarrow 5X = 360° - 4X$

$\Rightarrow 5X + 4X = 360°$

$\Rightarrow 9X = 360°$

$\Rightarrow X = 40°$

Therefore angle = 40°

And its supplement = 90° – 40° = 50°

15. Question

Find the measure of an angle, if seven times its complement is 10° less than three times its supplement.

Answer

25°

Let the measure of an angle = X

Complement of X = 90° – X

Supplement of X = 180° – X

According to question,

$\Rightarrow 7(90° - X) = 3(180° - X) - 10°$

⇒ 630° – 7X = 540° – 3X - 10°

⇒ – 7X + 3X = 540° – 10° – 630°

⇒ - 4X = 100°

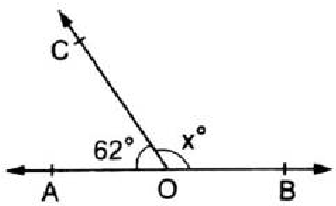
⇒ X = 25°

Therefore measure of an angle = 25°

Exercise 4B

1. Question

In the adjoining figure, AOB is a straight line. Find the value of x.



Answer

118°

AOB is a straight line

Therefore, ∠AOB = 180°

⇒ ∠AOC + ∠BOC = 180°

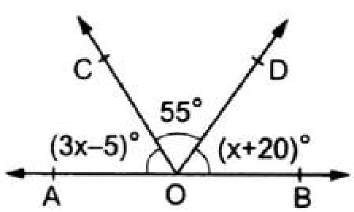
⇒ 62° + x = 180°

⇒ x = 180° – 62°

= 118°

2. Question

In the adjoining figure, AOB is a straight line. Find the value of x. Hence, Find $\angle AOC$ And $\angle BOD$



Answer

X=27.5, $\angle AOC$=77.5° $\angle BOD$=47.5°

AOB is a straight line

Therefore, $\angle AOC$ + ∠COD + $\angle BOD$ = 180°

⇒ (3x - 5)° + 55° + (x + 20)° = 180°

⇒ 3x - 5° + 55° + x + 20° = 180°

⇒ 4x = 180° - 70°

⇒ 4x = 110°

⇒ x = 27.5°

$\angle AOC$ = (3x - 5)°

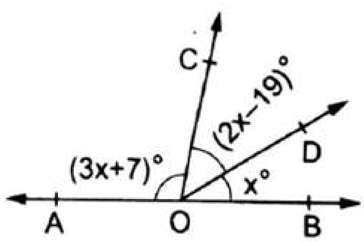
= 3×27.5 – 5 = 77.5°

$\angle BOD$ = (x + 20)°

= 27.5 + 20 = 47.5°

3. Question

In the adjoining figure, AOB is a straight line. Find the value of x. Hence, find $\angle AOC$, $\angle COD$ and $\angle BOD$.



Answer

X=32, $\angle AOC$ =103°, ∠COD =45° $\angle BOD$ =32°

AOB is a straight line

Therefore, $\angle AOC$ + ∠COD + $\angle BOD$ = 180°

⇒ (3x + 7)° + (2x - 19)° + x° = 180°

⇒ 3x + 7° + 2x - 19° + x° = 180°

⇒ 6x = 180° + 12°

⇒ 6x = 192°

⇒ x = 32°

$\angle AOC$ = (3x + 7)°

= 3×32° + 7 = 103°

∠COD = (2x - 19)°

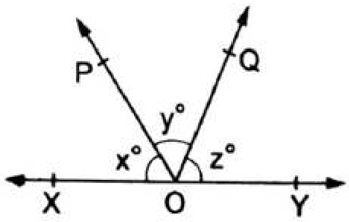
= 2×32° – 19 = 45°

$\angle BOD$ = x

= 32°

4. Question

In the adjoining figure, x: y: z =5:4:6. If XOY is a straight line, find the values of x, y and z



Answer

X=60, Y=48, Z=72

AOB is a straight line

Therefore, ∠XOP + ∠POQ + ∠YOQ = 180°

Given, x: y: z =5: 4: 6

Let ∠XOP = x° = 5a, ∠POQ = y° = 4a, ∠YOQ = z° = 6a

⇒ 5a + 4a + 6a = 180°

⇒ 15a = 180°

⇒ a = 12°

Therefore,

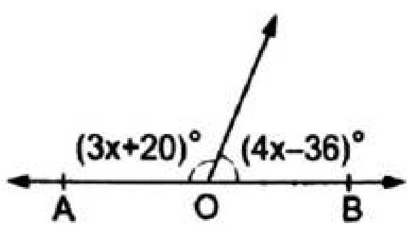
x = 5a = 5×12° = 60°

y = 4a = 4×12° = 48°

z = 6a = 6×12° = 72°

5. Question

In the adjoining figure, what value of x will make AOB, a straight line?



Answer

X=28°

AOB is a straight line

Therefore, ∠AOB = 180°

⇒ (3x +20)° + (4x -36)° = 180°

⇒ 3x + 20° + 4x - 36° = 180°

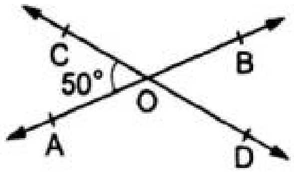
⇒ 7x - 16° = 180°

⇒ 7x = 196°

⇒ x = 28°

6. Question

Two lines AB and CD intersect at O. If $\angle AOC = 50°$, find $\angle AOD$ $\angle BOD$ and $\angle BOC$.



Answer

$\angle AOD = 130°$, $\angle BOD = 50°$, $\angle BOC = 130°$

Given AB and CD intersect a O

Therefore, $\angle AOC = \angle BOD$ ______________________ (i)

And ∠BOC = ∠AOD ______________________ (ii)

$\angle AOC = 50°$

Therefore, $\angle BOD = 50°$ from equation (i)

AOB is a straight line,

⇒ $\angle AOC + \angle BOC = 180°$

⇒ $50° + \angle BOC = 180°$

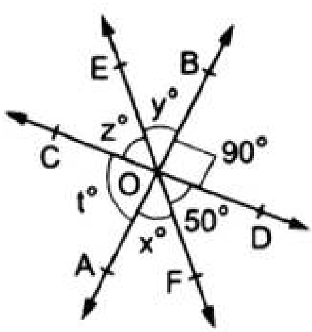
⇒ $\angle BOC = 180° - 50°$

⇒ $\angle BOC = 130°$

∠AOD = ∠BOC = 130° from equation (ii)

7. Question

In the adjoining figure, there coplanar lines AB, CD and EF intersect at a point O, forming angles as shown. Find the values of x, y, z and t.



Answer

X=4, Y=4, Z=50, t=90

Given, coplanar lines AB, CD and EF intersect at a point O.

Therefore, ∠AOF = ∠BOE _________________________ (i)

∠BOD = ∠AOC __________________________ (ii)

∠DOF = ∠COE __________________________ (iii)

x = y from equation (i)

t = 90 from equation (ii)

z = 50 from equation (iii)

∠AOF + ∠DOF + ∠BOD = 180° (from AOB straight line)

⇒ x + 50° + 90° = 180°

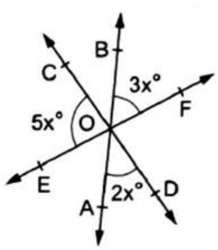
⇒ x = 180° - 140°

⇒ x = 40°

x = y = 40° from equation (i)

8. Question

In the adjoining, there coplanar lines AB, CD and EF intersect at a point O. Find the value of x. Hence, find $\angle AOD$, $\angle COE$ and $\angle AOE$.



Answer

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∠AOD + ∠DOF + ∠BOF + ∠BOC + ∠COE + ∠AOE = 360°

⇒ 2x + 5x + 3x + 2x + 5x + 3x = 360°

⇒ 20x = 360°

⇒ x = 18°

∠AOD = 2x = 2× 18° = 36°

∠COE = 3x = 3× 18° = 54°

∠AOE = 4x = 4× 18° = 72°

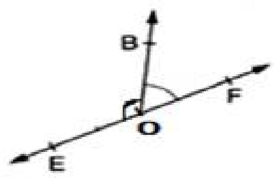
9. Question

Two adjacent angles on a straight line are in the ratio 5:4 Find the measure of each one of these angles.

Answer

100°, 80°

Explanation:



EOF is a straight line and its adjacent angles are ∠EOB and ∠FOB.

Let ∠EOB = 5a, and ∠FOB = 4a

∠EOB + ∠FOB = 180° (EOF is a straight line)

⇒5a + 4a = 180°

⇒9a = 180°

⇒ a = 20°

Therefore, ∠EOB = 5a

= 5 × 20° = 100°

And ∠FOB = 4a

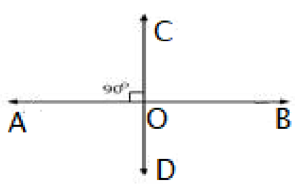
= 4 × 20° = 80°

10. Question

If two straight lines intersect each other in such a way that one of the angles formed measure 90°, show that each of the remaining angles measures 90°.

Answer

Proof



Given lines AB and CD intersect each other at point O and ∠AOC = 90°

∠AOC = ∠BOD (Opposite angles)

Therefore, ∠BOD = 90°

⇒ ∠BOD + ∠AOC = 180°

⇒ ∠BOC + 90° = 180°

⇒ ∠BOC = 90°

Now, ∠AOD = ∠BOC (Opposite angles)

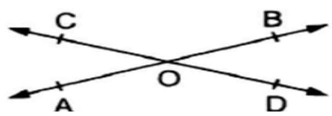
Therefore,

∠AOD = 90°

Proved each of the remaining angles measures 90°.

11. Question

Two lines AB and CD intersect at a point O such that $\angle BOC + \angle AOD$ =280°, as shown in the figure. Find all the four angles.



Answer

$\angle BOC$=140°, $\angle AOC$=40°, $\angle AOD$ = 140°, ∠BOD = 40°

Given lines AB and Cd intersect at a point O and $\angle BOC$ + $\angle AOD$ =280°

$\angle BOC$ = $\angle AOD$ (Opposite angle)

⇒$\angle BOC$ + $\angle AOD$ = 280°

⇒$\angle BOC$ + $\angle BOC$ = 280°

⇒ 2$\angle BOC$ = 280°

⇒$\angle BOC$ = 140°

$\angle BOC$ = $\angle AOD$ = 140°

Now,

$\angle AOC$ + $\angle BOC$ = 180° (Because AOB is a straight line)

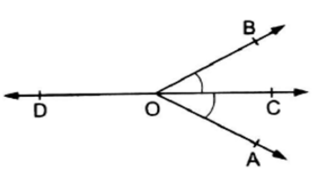
⇒$\angle AOC$ + 140° = 180°

⇒$\angle AOC$ = 40°

$\angle AOC$ = ∠BOD = 40°

12. Question

In the given figure, ray OC is the bisector of $\angle AOB$ and OD is the ray opposite to OC. Show that $\angle AOD$ = $\angle BOD$.



Answer

Proof

Given OC is the bisector of $\angle AOB$

Therefore, ∠AOC = ∠COB ________________________ (i)

DOC is a straight line,

$\angle BOD + \angle COB$ = 180° ________________ (ii)

Similarly, $\angle AOC + \angle AOD$ = 180° _________________ (iii)

From equations (i) and (ii)

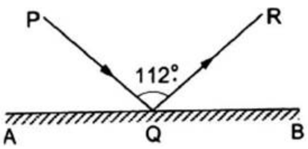
⇒ $\angle BOD + \angle COB = \angle AOC + \angle AOD$

⇒ $\angle BOD + \angle AOC = \angle AOC + \angle AOD$ (from equation (i))

⇒ $\angle BOD = \angle AOD$ Proved

13. Question

In the given figure, AB is a mirror; PQ is the incident ray and QR, the reflected ray. If $\angle PQR$ =112°, Find $\angle PQA$.



Answer

34°

Angle of incidence =angle of reflection.

Therefore, ∠PQA = ∠BQR ______________________ (i)

⇒ ∠BQR + ∠PQR + ∠PQA = 180°[Because AQB is a straight line]

⇒ ∠BQR + 112° + ∠PQA = 180°

⇒ ∠BQR + ∠PQA = 180° - 112°

⇒ ∠PQA + ∠PQA = 68° [from equation (i)]

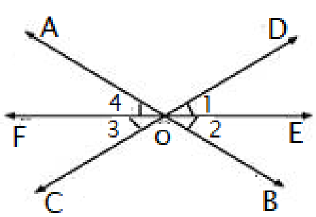
⇒ 2 ∠PQA = 68°

⇒ ∠PQA = 34°

14. Question

If two straight lines intersect each other then prove that the ray opposite to the bisector of one of the angles so formed bisects the vertically opposite angle.

Answer



Given, lines AB and CD intersect each other at point O.

OE is the bisector of ∠ BOD.

TO prove: OF bisects ∠AOC.

Proof:

AB and CD intersect each other at point O.

Therefore, ∠ AOC = ∠ BOD

∠ 1 = ∠ 2 [OE is the bisector of ∠BOD] ________________ (i)

∠ 1 = ∠ 3 and ∠ 2 = ∠ 4 [Opposite angles] ____________ (ii)

From equations (i) and (ii)

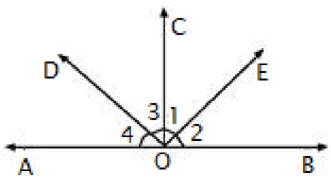
∠ 3 = ∠ 4

Hence, OF is the bisector of ∠AOC.

15. Question

Prove that the bisectors of two adjacent supplementary angles include a right angle.

Answer



Given, ∠AOC and ∠BOC are supplementary angles

OE is the bisector of ∠BOC and

OD is the bisector of ∠AOC

Therefore, ∠1 = ∠2 and ∠3 = ∠ 4 ________________ (i)

∠BOC + ∠AOC = 180° [Because AOB is a straight line]

⇒ ∠1 + ∠2 + ∠3 + ∠4 = 180°

⇒ ∠1 + ∠1 + ∠3 + ∠3 = 180° [From equation (i)]

⇒ 2 ∠1 +2 ∠3 = 180°

⇒ *2*(∠1 + ∠3) = 180°

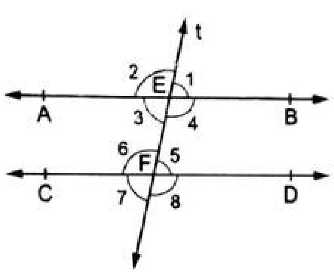
⇒ ∠1 + ∠3 = 90°

Hence, ∠EOD = 90° proved.

Exercise 4C

1. Question

In the adjoining figure, AB ||CD are cut by a transversal t at E and F respectively. If ∠1=70°, Find measure of each of the remaining marked angles.



Answer

$\angle 2$ =110°, $\angle 3$ =70°, $\angle 4$ =110°, $\angle 5$ =70°, $\angle 6$ =110°, $\angle 7$ =70°, $\angle 8$ =110°

Given AB ||CD are cut by a transversal t at E and F respectively.

And ∠1 = 70°

∠1 = ∠3 = 70° [Opposite angles]

∠5 = ∠1 = 70° [Corresponding angles]

∠3 = ∠7 = 70° [Corresponding angles]

∠1 + ∠2 = 180° [Because AB is a straight line]

⇒ 70° + ∠2 = 180°

⇒ ∠2 = 110°

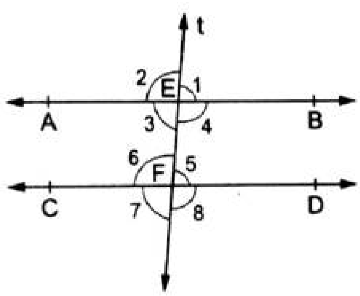
∠4 = ∠2 = 110° [Opposite angles]

∠6 = ∠2 = 110° [Corresponding angles]

∠8 = ∠4 = 110° [Corresponding angles]

2. Question

In the adjoining figure, AB ||CD are cut by a transversal t at E and F respectively. If $\angle 1 : \angle 2$ =5:4, Find measure of each of the remaining marked angles.



Answer

$\angle 1$=100°, $\angle 2$ =80°, $\angle 3$ =100° $\angle 4$ =80°, $\angle 5$ =100°, $\angle 6$ =80°, $\angle 7$ =100°, $\angle 8$ =80°

Given AB ||CD are cut by a transversal t at E and F respectively.

And $\angle 1 : \angle 2$ = 5:4

Let ∠1 = 5a and ∠2 = 4a

∠1 + ∠2 = 180° [Because AB is a straight line]

⇒ 5a + 4a = 180°

⇒ 9a = 180°

⇒ a = 20°

Therefore, ∠1 = 5a

∠1 = 5 × 20° = 100°

$\angle 2 = 4a$

$\angle 2 = 4 \times 20° = 80°$

$\angle 3 = \angle 1 = 100°$ [Opposite angles]

$\angle 4 = \angle 2 = 80°$ [Opposite angles]

$\angle 5 = \angle 1 = 100°$ [Crossponding angles]

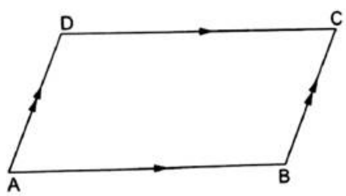
$\angle 6 = \angle 4 = 80°$ [Crossponding angles]

$\angle 7 = \angle 5 = 100°$ [Opposite angles]

$\angle 8 = \angle 6 = 80°$ [Opposite angles]

3. Question

In the adjoining figure, ABCD is a quadrilateral in which AB||DC and AD||BC. Prove that $\angle ADC = \angle ABC$.



Answer

Given AB||DC and AD||BC

Therefore, $\angle ADC + \angle DCB = 180°$ _____________ (i)

$\angle DCB + \angle ABC = 180°$ _____________ (ii)

From equations (i) and (ii)

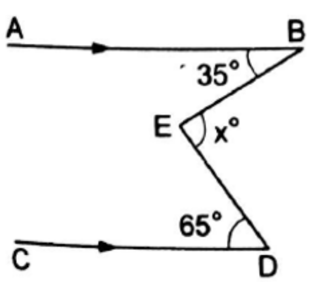
$\angle ADC + \angle DCB = \angle DCB + \angle ABC$

$\angle ADC = \angle ABC$ Proved.

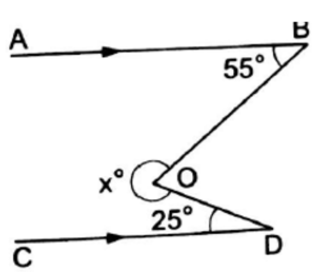
4. Question

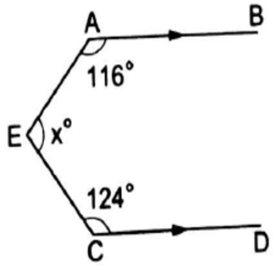
In each of the figure given below, AB||CD. Find the value of x in each case.

(i)



(ii)



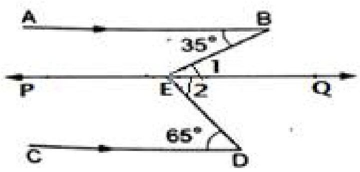
(iii) 

Answer

(i) x = 100

Given AB||CD, ∠ABE = 35° and ∠EDC = 65°

Draw a line PEQ||AB or CD



∠1 = ∠ABE = 35°[AB||PQ and alternate angle] ________________ (i)

∠2 = ∠EDC = 65°[CD||PQ and alternate angle] ________________ (ii)

From equations (i) and (ii)

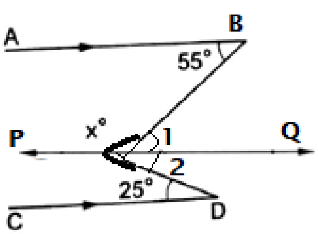
∠1 + ∠2 = 100°

⇒ x = 100°

(ii) x=280

Given AB||CD, ∠ABE = 35° and ∠EDC = 65°

Draw a line POQ||AB or CD



(ii)

∠1 = ∠ABO = 55°[AB||PQ and alternate angle] ________________ (i)

∠2 = ∠CDO = 25°[CD||PQ and alternate angle] ________________ (ii)

From equations (i) and (ii)

∠1 + ∠2 = 80°

Now,

∠BOD + ∠DOB = 360°

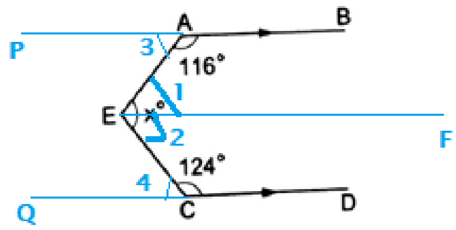
⇒ 80° + x° = 360°

⇒ x = 280°

(iii) x=120

Given AB||CD, ∠BAE = 116° and ∠DCE = 124°

Draw a line EF||AB or CD



(iii)

∠BAE + ∠PAE = 180° [Because PAB is a straight line]

⇒ 116° + ∠3 = 180°

⇒ ∠3 = 180° - 116°

⇒ ∠3 = 64°

Therefore,

∠1 = ∠3 = 64° [Alternate angles] ______________________ (i)

Similarly, ∠4 = 180° - 124°

∠4 = 56°

Therefore,

∠2 = ∠4 = 56° [Alternate angles] ______________________ (ii)

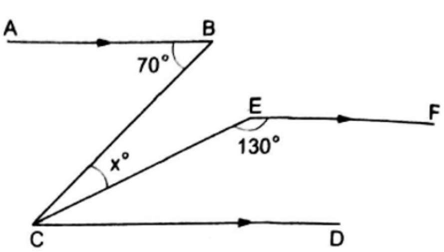
From equations (i) and (ii)

⇒ ∠1 + ∠2 = 64° + 56°

⇒ x = 120°

5. Question

In the given figure, AB||CD ||EF. Find the value of x.



Answer

X=20

Given AB||CD||EF, ∠ABC = 70° and ∠CEF = 130°

AB||CD

Therefore,

∠ABC = ∠BCD = 70° [Alternate angles] ________________ (i)

EF||CD

Therefore,

∠DCE + ∠CEF = 180°

⇒ ∠DCE + 130° = 180°

⇒ ∠DCE = 50°

Now,

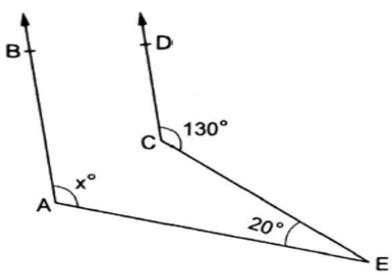
∠BCE + ∠DCE = ∠BCD

⇒ x + 50° = 70°

⇒ x = 20°

6. Question

In the given figure, AB||CD. Find the value of x.

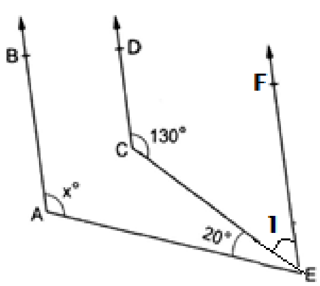


Answer

X=110

Given AB||CD, ∠DCE = 130° and ∠AEC = 20°

Draw a line EF||AB||CD



CD||EF

Therefore, ∠DCE + ∠CEF = 180°

⇒ 130° + ∠1 = 180°

⇒ ∠1 = 180° - 130°

⇒ ∠1 = 50°

AB||EF

Therefore, ∠BAE + ∠AEF = 180°

⇒ x + ∠1 + 20° = 180°

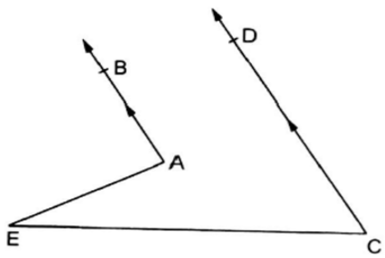
⇒ x + 50° + 20° = 180°

⇒ x = 180° - 70°

⇒ ***x* = 110°**

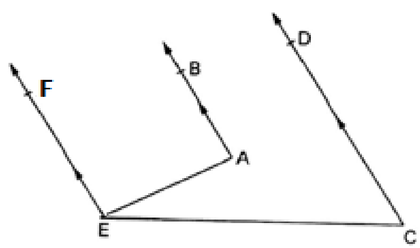
7. Question

In the given figure, AB||CD. Prove that $\angle BAE - \angle DCE = \angle AEC$.



Answer

Draw a line EF||AB||CD.



$\angle BAE + \angle AEF$ =180° [Because AB||EF and AE is the transversal] ____________________ (i)

$\angle DCE + \angle CEF$ =180° [Because DC||EF and CE is the transversal] ____________________ (ii)

From equations (i) and (ii)

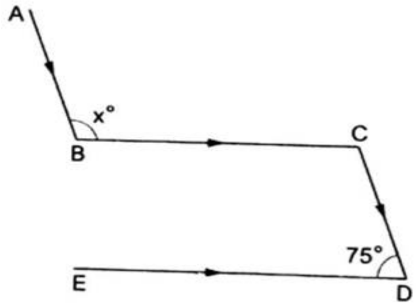
⇒ $\angle BAE + \angle AEF = \angle DCE + \angle CEF$

⇒ $\angle BAE - \angle DCE = \angle CEF - \angle AEF$

⇒ $\angle BAE - \angle DCE = \angle AEC$ Proved.

8. Question

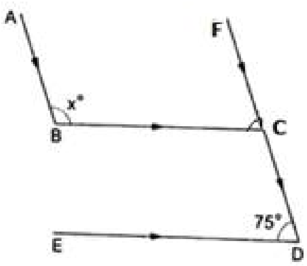
In the given figure, AB||CD and BC||ED. Find the value of x.



Answer

X=105

Given AB||CD and BC||ED.



AB||CD

Therefore, ∠BCF = ∠EDC = 75° [Crossponding angles]

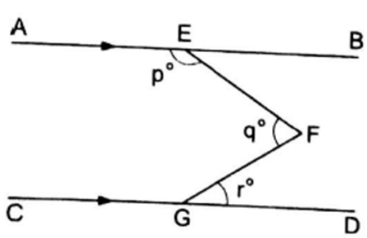
∠ABC + ∠BCF = 180° [Because AB||DCF]

⇒ x + 75° = 180°

⇒ x = 105°

9. Question

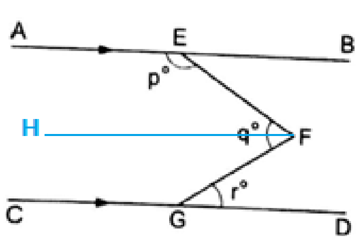
In the given figure, AB||CD. Prove that p+q-r=180



Answer

Given AB||CD, ∠AEF = P°, ∠EFG = q°, ∠FGD = r°

Draw a line FH||AB||CD



$\angle HFG = \angle FGD = r°$ [Because HF||CD and alternate angles] ___________ (i)

$\angle EFH = \angle EFG - \angle HFG$

$\Rightarrow \angle EFH = q - r$ ______________________ (i)

$\angle AEF + \angle EFH = 180°$ [Because AB||HF]

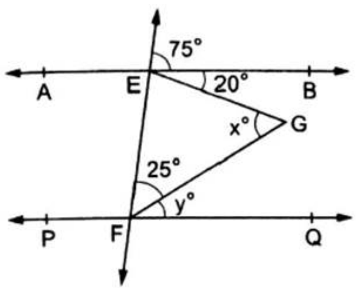
$\Rightarrow \angle AEF + \angle EFH = 180°$

$\Rightarrow p + (q - r) = 180°$

$\Rightarrow p + q - r = 180°$Proved.

10. Question

In the given figure, AB||PQ. Find the value of x and y.



Answer

x=70, y=50

Given AB||PQ

$\angle GEF + 20° + 75° = 180°$[Because EF is a straight line]

$\Rightarrow \angle GEF = 180° - 95°$

$\Rightarrow \angle GEF = 85°$________________ (i)

In triangle EFG,

$\Rightarrow X + 25° + 85° = 180°$ [$\angle GEF = 85°$]

$\Rightarrow X = 60°$

Now,

$\Rightarrow \angle BEF + \angle EFQ = 180°$[Interior angles on same side of transversal]

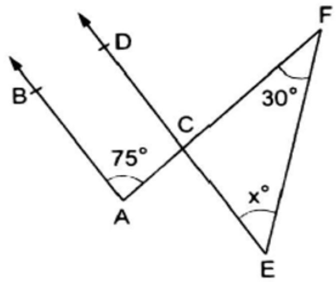
$\Rightarrow (20° + 85°) + (25° + Y) = 180°$

$\Rightarrow Y = 180° - 130°$

$\Rightarrow Y = 50°$

11. Question

In the given figure, AB ||CD. Find the value of x.



Answer

Given AB||CD

Therefore, ∠BAC + ∠ACD = 180°

⇒ 75° + ∠ACD = 180°

⇒ ∠ACD = 105°__________________ (i)

∠ACD = ∠ECF = 105°[Opposite angles]

In triangle CEF,

⇒ ∠CEF + ∠EFC + ∠FCE = 180°

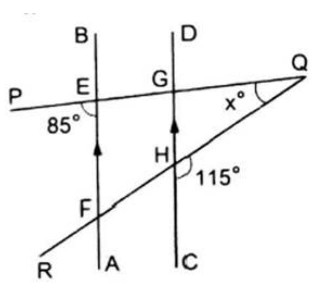
⇒ x + 30° + 105° = 180°

⇒ x + 135° = 180°

⇒ x = 45°

12. Question

In the given figure, AB||CD. Find the value of x.



Answer

x=20

Given AB||CD

Therefore,

$\angle QGH = \angle GEF$ [Crossponding angles]

$\angle QGH$ = 95° ____________________ (i)

In CD straight line,

⇒ $\angle CHQ + \angle GHQ$ =180°

⇒ 115° + $\angle GHQ$ = 180°

⇒ $\angle GHQ$ = 65°

In triangle GHQ,

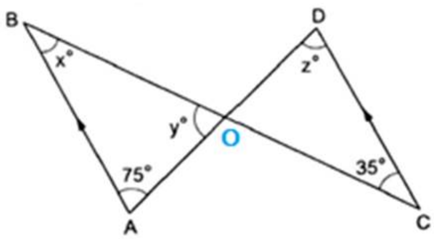
⇒ ∠QGH + ∠GHQ + ∠GQH = 180°

⇒ 95° + 65° + x = 180°

⇒ x = 20°

13. Question

In the given figure, AB||CD. Find the value of x, y and z.



Answer

Z=75, x=35, y=70

Given AB||CD

Therefore,

X = 35°[Alternate angles]

In triangle AOB,

⇒ x + 75° + y = 180°

⇒ 35° + 75° + y = 180°

⇒ y = 70°

⇒ ∠COD = y = 70°[Opposite angles]

In triangle COD,

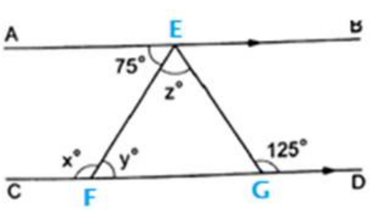
⇒ z + 35° + ∠COD = 180°

⇒ z + 35° + 70° = 180°

⇒ z = 75°

14. Question

In the given figure, AB||CD. Find the values of x, y and z.



Answer

x=105, y=75, z=50

Given AB||CD

Therefore,

⇒ ∠AEF = ∠EFG = 75°[Alternate angles]

⇒ y = 75°

For CD straight line,

⇒ x + y = 180°

⇒ x + 75° = 180°

⇒ x = 105°

Again,

⇒ ∠EGF + 125° = 180°

⇒ ∠EGF = 155°

In triangle EFG,

⇒ y + z + ∠EGF = 180°

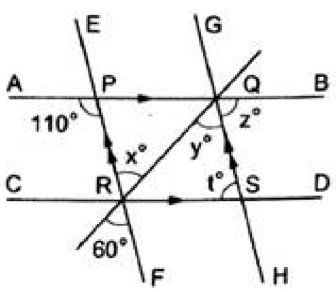
⇒ 75°+ z + 155°= 180°

⇒ z + 130°= 180°

⇒ z = 50°

15. Question

In the given figure, AB||CD and EF||GH. Find the values of x, y, z and t.



Answer

X=60, y=60, z=70, t=70

Given AB||CD and EF||GH

x = 60° [Opposite angles]

y = x = 60°[Alternate angles]

∠PQS = ∠APR = 110°[Crossponding angles]

∠PQS = ∠PQR + y = 110°______________ (i)

For AB straight line,

⇒ y + z + ∠PQR = 180°

⇒ z + 110° = 180°[From equation (i)]

⇒ z = 70°

AB||CD

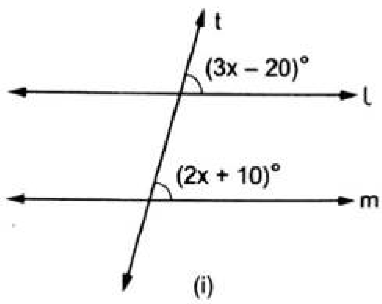
Therefore,

t = z = 70°[Because alternate angles]

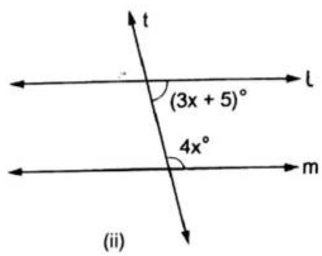
16. Question

For what value of x will the lines I and m be parallel to each other?

(i).



(ii)



Answer

(i) x=30

Given l||m

Therefore,

3x – 20° = 2x + 10° [Crossponding angles]

⇒ 3x – 2x = 10° + 20°

⇒ x = 30°

(ii) x=25

Given l||m

Therefore,

(3x + 5)° + 4x° = 180°

⇒ 7x + 5° = 180°

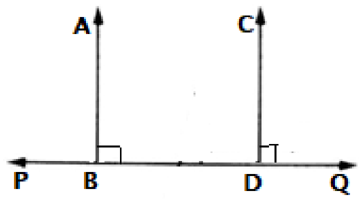
⇒ 7x = 175°

⇒ x = 25°

17. Question

If two straight lines are perpendicular to the same line, prove that they are parallel to each other.

Answer



AB⊥PQ,

Therefore, ∠ABD = 90° ______________ (i)

CD⊥PQ,

Therefore, ∠CDQ = 90° ______________ (ii)

From equations (i0 and (ii)

∠ABD = ∠CDQ = 90°

Hence, AB||CD because Cross ponding angles are equal.

Exercise 4D

1. Question

In ΔABC, if = $\angle B$ =76°and $\angle C$ =48°, find $\angle A$.

Answer

$\angle A$ =56°

In ΔABC,

∠A + ∠B + ∠C = 180° [Sum of angles]

⇒ ∠A + 76° + 48° = 180°

⇒ ∠A + 124° = 180°

⇒ ∠A = 56°

2. Question

The angles of a triangle are in the ratio 2:3:4. Find the angles.

Answer

40°, 60°, 80°

Let the angles of triangle are 2a, 3a and 4a.

Therefore,

2a + 3a + 4a = 180°[Sum of angles]

⇒ 9a = 180°

⇒ a = 20°

Angles of triangle are,

2a = 2 × 20° = 40°

3a = 3 × 20° = 60°

4a = 4 × 20° = 80°

3. Question

In ΔABC, if $3\angle A = 4\angle B = 6\angle C$, calculate $\angle A$, $\angle B$ and $\angle C$.

Answer

$\angle A$ =80°, $\angle B$ =60°, $\angle C$ =40°

Let $3\angle A = 4\angle B = 6\angle C$ = a

Therefore,

∠A = a/3, ∠B = a/4, ∠C = a/6 ______________________ (i)

∠A + ∠B + ∠C = 180° [Sum of angles]

⇒ a/3 + a/4 + a/6 = 180°

⇒ 9a/12 = 180°

⇒ a = 240°

⇒ ∠A = a/3 = 240° /3 = 80°

⇒ ∠B = a/4 = 240° /4 = 60°

⇒ ∠C = a/6 = 240° /6 = 40°

4. Question

In ΔABC, if $\angle A + \angle B$ =108° and $\angle B + \angle C$ =130°, Find $\angle A$, $\angle B$ and $\angle C$.

Answer

$\angle A$ =50°, $\angle B$ =58°, $\angle C$ =72°

Given,

$\angle A + \angle B$ = 108° _____________________ (i)

$\angle B + \angle C$ = 130° _____________________ (ii)

We know that sum of angles of triangle = 180°

∠A + ∠B + ∠C = 180° [Sum of angles]

∠A + 130°= 180° [From equation (ii)]

⇒ ∠A = 50°

Value of ∠A = 50° put in equation (i),

$\angle A + \angle B$ = 108°

$\Rightarrow 50° + \angle B = 108°$

$\Rightarrow \angle B = 58°$

Value of ∠B = 58° put in equation (ii),

$\angle B + \angle C = 130°$

$\Rightarrow 58° + \angle C = 130°$

$\Rightarrow \angle C = 72°$

5. Question

In ΔABC, if $\angle A + \angle B = 125°$ and $\angle B + \angle C = 113°$, Find $\angle A$, $\angle B$ and $\angle C$.

Answer

$\angle A = 67°$, $\angle B = 41°$, $\angle C = 89°$

Given,

$\angle A + \angle B = 125°$ ____________________ (i)

$\angle B + \angle C = 113°$ ____________________ (ii)

We know that sum of angles of triangle = 180°

∠A + ∠B + ∠C = 180° [Sum of angles]

∠A + 113°= 180° [From equation (ii)]

⇒ ∠A = 67°

Value of ∠A = 50° put in equation (i),

$\angle A + \angle B = 125°$

$\Rightarrow 67° + \angle B = 108°$

$\Rightarrow \angle B = 41°$

Value of ∠B = 41° put in equation (ii),

$\angle B + \angle C = 130°$

$\Rightarrow 41° + \angle C = 130°$

$\Rightarrow \angle C = 89°$

6. Question

In ΔPOR, if $\angle P - \angle Q = 42°$ and $\angle Q - \angle R = 21°$, Find $\angle P$, $\angle Q$ and $\angle R$.

Answer

$\angle P = 95°$, $\angle Q = 53°$, $\angle R = 32°$

Given,

$\angle P - \angle Q = 42°$ ____________________ (i)

$\angle Q - \angle R = 21°$ ____________________ (ii)

$\angle P$ = 42° + $\angle Q$ [From equation (i)] ____________________ (iii)

$\angle R$ = $\angle Q$ - 21° [From equation (ii)] ____________________ (iv)

We know that sum of angles of triangle = 180°

∠P + ∠Q + ∠R = 180° [Sum of angles]

⇒ 42° + ∠Q + ∠Q + ∠Q - 21° = 180° [From equation (iii) and (iv)]

⇒ 3 ∠Q + 21°= 180°

⇒ 3 ∠Q = 159°

⇒ ∠Q = 53°

Value of ∠Q = 53° put in equation (iii),

$\angle P$ = 42° + $\angle Q$

⇒ $\angle P$ = 42° + 53°

⇒ $\angle P$ = 95°

Value of ∠Q = 53° put in equation (iv),

$\angle R$ = $\angle Q$ - 21°

⇒ $\angle R$ = 53° - 21°

⇒ $\angle R$ = 32°

7. Question

The sum of two angles of a triangle is 116° and their difference is 24°.Find the measure of each angle of the triangle.

Answer

70°, 46°, 64°

Let ∠P, ∠Q and ∠R are three angles of triangle PQR.

Now,

∠P + ∠Q = 116° ____________________ (i)

∠P - ∠Q = 24° ____________________ (i)

Adding equation (i) and (ii),

2 ∠P = 140°

⇒ ∠P = 70° ________________________ (iii)

Subtracting equation (i) and (ii),

2 ∠Q = 92°

⇒ ∠Q = 46° _________________________ (iv)

We know that sum of angles of triangle = 180°

$\angle P + \angle Q + \angle R = 180°$ [Sum of angles]

$\Rightarrow 70° + 46° + \angle R = 180°$ [From equation (iii) and (iv)]

$\Rightarrow \angle R = 64°$

8. Question

Of the three angles of a triangle are equal and the third angle is greater than each one of them by 18°. Find the angle.

Answer

54°, 54°, 72°

Let $\angle P$, $\angle Q$ and $\angle R$ are three angles of triangle PQR,

And $\angle P = \angle Q = a$ ________________ (i)

Then, $\angle R = a + 18°$________________ (ii)

We know that sum of angles of triangle = 180°

$\angle P + \angle Q + \angle R = 180°$ [Sum of angles]

$\Rightarrow a + a + a + 18° = 180°$ [From equation (i) and (ii)]

$\Rightarrow 3a = 162°$

$\Rightarrow a = 54°$

Therefore,

$\angle P = \angle Q = 54°$ [from equation (i)]

$\angle R = 54° + 18°$ [from equation (i)]

$= 72°$

9. Question

Of the three angles of a triangle, one is twice the smallest and mother one is thrice the smallest. Find the angle.

Answer

60°, 90°, 30°

Let $\angle P$, $\angle Q$ and $\angle R$ are three angles of triangle PQR,

And $\angle P$ is the smallest angle.

Now,

$\angle Q = 2\angle P$ ________________ (i)

$\angle R = 3\angle P$ ________________ (ii)

We know that sum of angles of triangle = 180°

$\angle P + \angle Q + \angle R = 180°$ [Sum of angles]

⇒ ∠P + *2* ∠P + 3 ∠P = 180° [From equation (i) and (ii)]

⇒ 6 ∠P = 180°

⇒ ∠P = 30°

Therefore,

⇒ ∠Q = *2* ∠P = 60° [from equation (i)]

⇒ ∠R = *3* ∠P = 90° [from equation (ii)]

10. Question

In a right-angled triangle, one of the acute measures 53°· Find the measure of each angle of the triangle.

Answer

53°, 37°, 90°

Let PQR be a right angle triangle.

Right angle at P, then

∠P = 90° and ∠Q = 53° ———————————————————— (i)

We know that sum of angles of triangle = 180°

∠P + ∠Q + ∠R = 180° [Sum of angles]

⇒ 90° + 53° + ∠R = 180° [From equation (i)]

⇒ ∠R = 37°

11. Question

If one angle of a triangle is equal to the sum of the other two, show that the triangle is right angled.

Answer

Proof

Let PQR be a right angle triangle,

Now,

∠P = ∠Q + ∠R ___________________ (i)

We know that sum of angles of triangle = 180°

∠P + ∠Q + ∠R = 180° [Sum of angles]

⇒ ∠P + ∠P = 180° [From equation (i)]

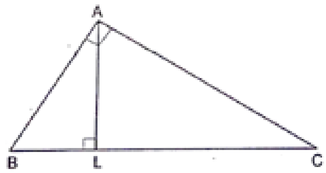
⇒ 2 ∠P = 180°

⇒ ∠P = 90°

Hence, PQR is a right angle triangle Proved.

12. Question

A ΔABC is right angled at A. If AL $\perp$ BC, prove that $\angle BAL = \angle ACB$.



Answer

proof

We know that the sum of two acute angles of a right triangle is 90°.

Therefore,

$\angle BAL + \angle ABL$ =90°

$\Rightarrow \angle BAL$ = 90°- $\angle ABL$

$\Rightarrow \angle BAL$ = 90°- $\angle ABC$ ____________________ (i)

$\angle ABC + \angle ACB$ =90°

$\Rightarrow \angle ACB$ = 90°- $\angle ABC$ ____________________ (ii)

From equation (i) and (ii),

$\angle BAL$ = $\angle ACB$ Proved.

13. Question

If each angle of a triangle is less than the sum of the other two, show that the triangle is acute angled.

Answer

Proof

Let ABC be a triangle,

Now,

$\angle A$ < $\angle B + \angle C$ ____________________ (i)

$\angle B$ < $\angle A + \angle C$ ____________________ (ii)

$\angle C$ < $\angle A + \angle B$ ____________________ (iii)

$\Rightarrow$ 2$\angle A$ < $\angle A + \angle B + \angle C$ [From equation (i)]

$\Rightarrow$ 2$\angle A$ < 180° [Sum of angles of triangle]

$\Rightarrow \angle A$ < 90° ________________ (a)

Similarly,

$\Rightarrow \angle B$ < 90°__________________ (b)

$\Rightarrow \angle C$ < 90°__________________ (c)

From equation (a), (b) and (c), each angle is less than 90°

Therefore triangle is an acute angled Proved.

14. Question

If each angle of a triangle is greater than the sum of the other two, show that the triangle is obtuse angled.

Answer

Proof

Let ABC be a triangle,

Now,

$\angle A$ > $\angle B + \angle C$ ____________________ (i)

$\angle B$ > $\angle A + \angle C$ ____________________ (ii)

$\angle C$ > $\angle A + \angle B$ ____________________ (iii)

⇒ 2$\angle A$ > $\angle A + \angle B + \angle C$ [From equation (i)]

⇒ 2$\angle A$ > 180° [Sum of angles of triangle]

⇒ $\angle A$ > 90° _________________ (a)

Similarly,

⇒ $\angle B$ > 90°___________________ (b)

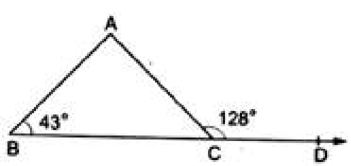
⇒ $\angle C$ > 90°___________________ (c)

From equation (a), (b) and (c), each angle is less than 90°

Therefore triangle is an acute angled Proved.

15. Question

In the given figure, side BC of △ABC is produced to D. If $\angle ACD$ =128° and $\angle ABC$ =43°,Find $\angle BAC$ and $\angle ACB$.



Answer

∠BAC = 85°, ∠ACB = 52°

Given, $\angle ACD$ =128° and $\angle ABC$ =43°

In triangle ABC,

∠ACB + ∠ACD = 180° [Because BCD is a straight line]

⇒ ∠ACB + 128° = 180°

⇒ ∠ACB = 52°

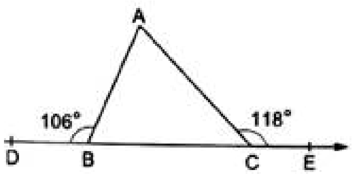
∠ABC + ∠ACB + ∠BAC = 180° [Sum of angles of triangle ABC]

⇒ 43° + 52° + ∠BAC = 180°

⇒ ∠BAC = 85°

16. Question

In the given figure, the side BC of ΔABC has been produced on both sides-on the left to D and on the right to E. If $\angle ABD$=106° and $\angle ACE$ =118°, Find the measure of each angle of the triangle.



Answer

74°, 62°, 44°

Given, $\angle ABD$=106° and $\angle ACE$ =118°

∠ABD + ∠ABC = 180° [Because DC is a straight line]

⇒ 106° + ∠ABC = 180°

⇒ ∠ABC = 74°_______________ (i)

∠ACB + ∠ACE = 180° [Because BE is a straight line]

⇒ ∠ACB + 118° = 180°

⇒ ∠ACB = 62°_______________ (ii)

Now, triangle ABC

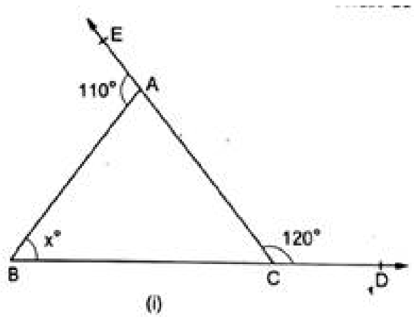
∠ABC + ∠ACB + ∠BAC = 180° [Sum of angles of triangle]

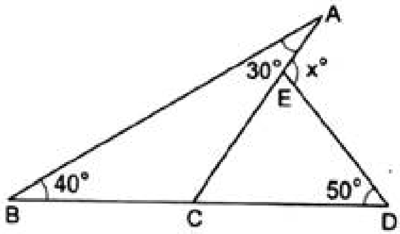
⇒ 74° + 62° + ∠BAC = 180° [From equation (i) and (ii)]

⇒ ∠BAC = 44°

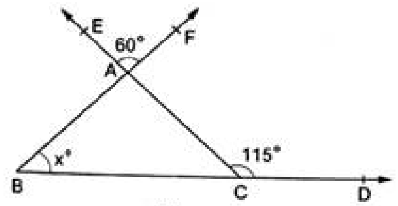
17. Question

Calculate the value of x in each of the following figure.

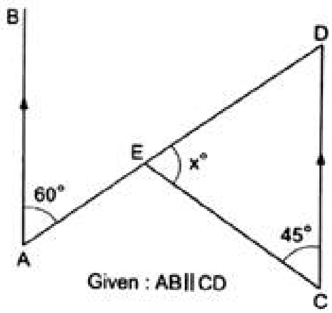
(i). 

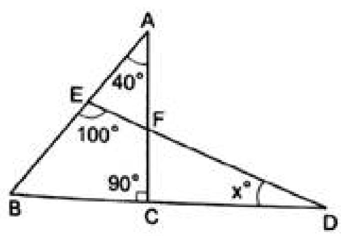
(ii) 

(ii)

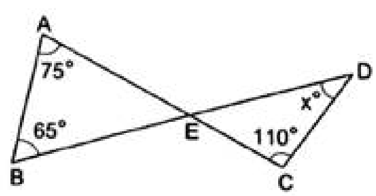
(iii) 

(iii)

(iv) 

(v) 

(v)

(vi) 

(vi)

Answer

(i) 50°

Given, ∠BAE = 110° and ∠ACD = 120°

∠ACB + ∠ACD = 180° [Because BD is a straight line]

⇒ ∠ACB + 120° = 180°

⇒ ∠ACB = 60°_______________ (i)

In triangle ABC,

∠BAE = ∠ABC + ∠ACB

⇒ 110° = x + 60°

⇒ x = 50°

(ii) 120°

In triangle ABC,

∠A + ∠B + ∠C = 180° [Sum of angles of triangle ABC]

⇒ 30° + 40° + ∠C = 180°

⇒ ∠C = 110°

∠BCA + ∠DCA = 180° [Because BD is a straight line]

⇒ 110° + ∠DCA = 180°

⇒ ∠DCA = 70°__________________ (i)

In triangle ECD,

∠AED = ∠ECD + ∠EDC

⇒ x = 70°+ 50°

⇒ x = 120°

(iii) 55°

Explanation:

∠BAC = ∠EAF = 60°[Opposite angles]

In triangle ABC,

∠ABC + ∠BAC = ∠ACD

⇒ X°+ 60°= 115°

⇒ X°= 55°

(iv) 75°

Given AB||CD

Therefore,

∠BAD = ∠EDC = 60°[Alternate angles]

In triangle CED,

∠C + ∠D + ∠E = 180°[Sum of angles of triangle]

⇒ 45° + 60° + x = 180°[∠EDC = 60°]

⇒ x = 75°

(v) 30°

Explanation:

In triangle ABC,

∠BAC + ∠BCA + ∠ABC = 180°[Sum of angles of triangle]

⇒ 40° + 90° + ∠ABC = 180°

⇒ ∠ABC = 50°________________ (i)

In triangle BDE,

∠BDE + ∠BED + ∠EBD = 180°[Sum of angles of triangle]

⇒ x° + 100° + 50° = 180°[∠EBD = ∠ABC = 50°]

⇒ x° = 30°

(vi) x=30

Explanation:

In triangle ABE,

∠BAE + ∠BEA + ∠ABE = 180°[Sum of angles of triangle]

⇒ 75° + ∠BEA + 65° = 180°

⇒ ∠BEA = 40°

∠BEA = ∠CED = 40°[Opposite angles]

In triangle CDE,

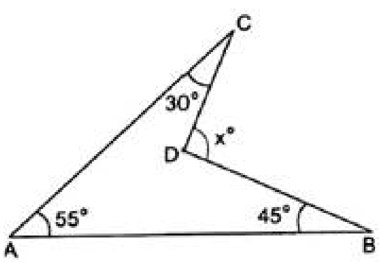
∠CDE + ∠CED + ∠ECD = 180°[Sum of angles of triangle]

⇒ x° + 40° + 110° = 180°

⇒ x° = 30°

18. Question

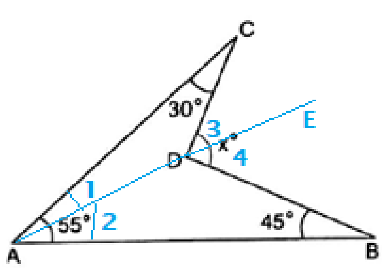
Calculate the value of x in the given figure.



Answer

x=130

Explanation:



In triangle ACD,

$\angle 3 = \angle 1 + \angle C$ ___________________ (i)

In triangle ABD,

$\angle 4 = \angle 2 + \angle B$ ___________________ (ii)

Adding equation (i) and (ii),

$\angle 3 + \angle 4 = \angle 1 + \angle C + \angle 2 + \angle B$

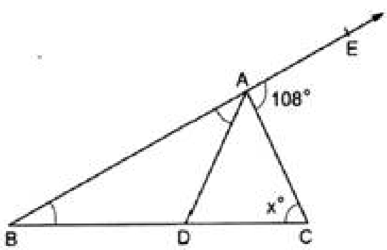
$\Rightarrow \angle BDC = (\angle 1 + \angle 2) + \angle C + \angle B$

$\Rightarrow x° = 55° + 30° + 45°$

$\Rightarrow x° = 130°$

19. Question

In the given figure, AD divides $\angle BAC$ in the ratio 1:3 and AD=DB. Determine the value of.



Answer

X=90

Explanation:

$\angle BAC + \angle CAE = 180°$[Because BE is a straight line]

$\Rightarrow \angle BAC + 108° = 180°$

$\Rightarrow \angle BAC = 72°$

Now,AD = DB

$\Rightarrow \angle DBA = \angle BAD$

$\angle BAD$ = (�)72°= 18°

$\angle DAC$ = (�)72°= 54°

In triangle ABC,

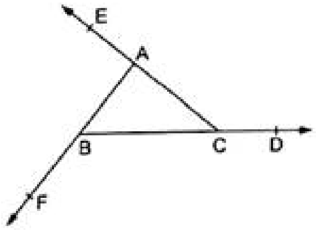
$\angle A + \angle B + \angle C = 180°$[Sum of angles of triangle]

$\Rightarrow 72° + 18° + x = 180°$

$\Rightarrow x = 90°$

20. Question

If the side of a triangle are produced in order, Prove that the sum of the exterior angles so formed is equal to four right angles.



Answer

Proof

In triangle ABC,

$\angle ACD = \angle B + \angle A$ _________________ (i)

$\angle BAE = \angle B + \angle C$ _________________ (ii)

$\angle CBF = \angle C + \angle A$ _________________ (iii)

Adding equation (i), (ii) and (iii),

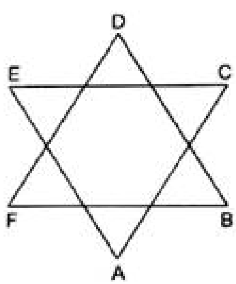
$\angle ACD + \angle BAE + \angle CEF$ = 2($\angle A + \angle B + \angle C$)

⇒ $\angle ACD + \angle BAE + \angle CEF$ = 2(180°) [Sum of angles of triangle]

⇒ $\angle ACD + \angle BAE + \angle CEF$ = 360°Proved.

21. Question

In the adjoining figure, show that $\angle A + \angle B + \angle C + \angle D + \angle E + \angle F$ =360°



Answer

Proof

In triangle BDF,

$\angle A + \angle C + \angle E$ = 180°[Sum of angles of triangle] ________________ (i)

In triangle BDF,

$\angle B + \angle D + \angle F$ = 180°[Sum of angles of triangle] ________________ (ii)

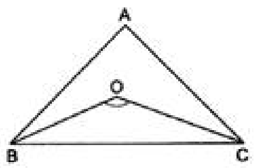
From equation (i) and (ii),

($\angle A + \angle C + \angle E$) + ($\angle B + \angle D + \angle F$) = (180°+180°)

⇒ $\angle A + \angle B + \angle C +$ $\angle D + \angle E + \angle F$ = 360°Proved.

22. Question

In $\triangle$ABC the angle bisectors of $\angle B$ and $\angle C$ meet at O. If $\angle A$ =70°,Find $\angle BOC$.



Answer

125°

Given, bisector of $\angle B$ and $\angle C$ meet at O.

If OB and OC are the bisector of $\angle B$ and $\angle C$ meet at point O .

Then,

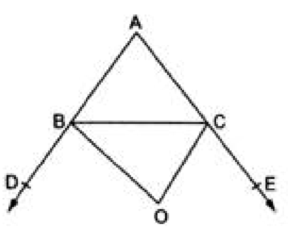
$\angle BOC$ = 90°+ $\frac{1}{2}$ $\angle A$

⇒ $\angle BOC$ = 90°+ $\frac{1}{2}$ 70°

⇒ $\angle BOC$ = 125°

23. Question

The sides AB and AC of $\triangle$ABC have been produced to D and E respectively. The bisectors of $\angle CBD$ and $\angle BCE$ meet at O. If $\angle A$ =40° find $\angle BOC$.



Answer

70°

Given, bisector of $\angle CBD$ and $\angle BCE$ meet at O.

If OB and OC are the bisector of $\angle CBD$ and $\angle BCE$ meet at point O .

Then,

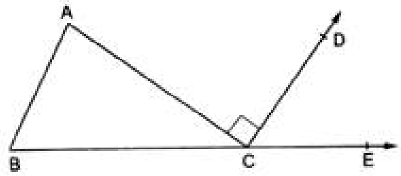
$\angle BOC$ = 90°- $\frac{1}{2}$ $\angle A$

⇒ $\angle BOC$ = 90°- $\frac{1}{2}$ 40°

⇒ $\angle BOC$ = 70°

24. Question

In the given figure, ABC is a triangle in which $\angle A$: $\angle B$: $\angle C$ =3:2:1 and AC $\perp$ CD. Find the measure of $\angle ECD$.



Answer

60°

Given, $\angle A : \angle B : \angle C$ = 3:2:1 and AC $\perp$ CD

Let, ∠A = 3a

∠B = 2a

∠C = a

In triangle ABC,

∠A + ∠B + ∠C = 180°[Sum of angles of triangle]

⇒ 3a + 2a + a = 180°

⇒ 6a = 180°

⇒ a = 30°

Therefore, ∠C = a = 30°

Now,

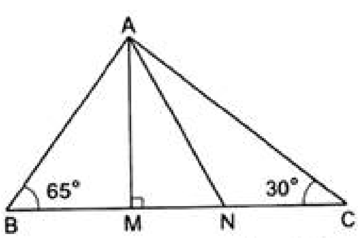
∠ACB + ∠ACD + ∠*E*CD = 180°[Sum of angles of triangle]

⇒ 30° + 90° + ∠*E*CD = 180°

⇒ ∠*E*CD = 60°

25. Question

In the given figure, AM $\perp$ BC and AN is the bisector of $\angle A$. Find the measure of $\angle MAN$.



Answer

17.5°

Given, AM$\perp$BC and "AN" is the bisector of $\angle A$.

Therefore,

$$\angle MAN = \frac{1}{2}(\angle B - \angle C)$$

$\Rightarrow \angle MAN = \frac{1}{2}(65° - 30°)$

$\Rightarrow \angle MAN = 17.5°$

26. Question

State 'True' or 'false':

(i) A triangle can have two right angles.

(ii) A triangle cannot have two obtuse angles.

(iii) A triangle cannot have two acute angles.

(iv) A triangle can have each angle less than 60°.

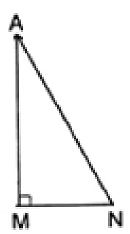
(v) A triangle can have each angle equal to 60°.

(vi) There cannot be a triangle whose angles measure 10°, 80° and 100°.

Answer

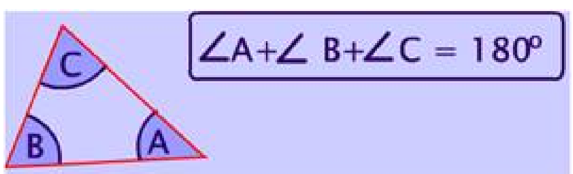
(i) False

Because, sum of angles of triangle equal to 180°.In a triangle maximum one right angle.



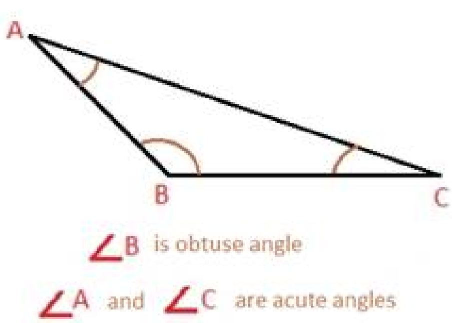
(ii) True

Because, obtuse angle measures in 90° to 180° and we know that the sum of angles of triangle is equal to 180°.



(iii) False

Because, in an obtuse triangle is one with one obtuse angle and two acute angles.



(iv) False

If each angles of triangle is less than 180° then sum of angles of triangle are not equal to 180°.

Any triangle,

$\angle 1 + \angle 2 + \angle 3 = 180°$

(v) True

If value of angles of triangle is same then the each value is equal to 60°.

$\angle 1 + \angle 2 + \angle 3 = 180°$

$\Rightarrow \angle 1 + \angle 1 + \angle 1 = 180° [\angle 1 = \angle 2 = \angle 3]$

$\Rightarrow 3 \angle 1 = 180°$

$\Rightarrow \angle 1 = 60°$

(vi) True

We know that sum of angles of triangle is equal to 180°.

Sum of angles,

$= 10° + 80° + 100°$

$= 190°$

Therefore, angles measure in (10°, 80°, 100°) cannot be a triangle.

CCE Questions

1. Question

If two angles are complements of each other, then each angle is

A. an acute angle

B. an obtuse angle

C. a right angle

D. a reflex angle

Answer

If two angles are complements of each other, then each angle is an acute angle

2. Question

An angle which measures more than 180° but less than 360°, is called

A. an acute angle

B. an obtuse angle

C. a straight angle

D. a reflex angle

Answer

An angle which measures more than 180^{o} but less than 360^{o}, is called a reflex angle.

3. Question

The complement of $72°40'$ is

A. $107°20'$

B. $27°20'$

C. $17°20'$

D. $12°40'$

Answer

As we know that sum of two complementary – angles is 90^o.

So, $x + y = 90^o$

$72°40' + y= 90$

$y = 90^o - 72°40'$

$y = 17^o20'$

4. Question

The supplement of $54°30'$ is

A. $35°30'$

B. $125°30'$

C. $45°30'$

D. $65°30'$

Answer

As we know that sum of two supplementary – angles is 180^o.

So, $x + y = 180^o$

$54°30' + y= 180$

$y = 180^o - 54°30'$

$y = 125^o30'$

5. Question

The measure of an angle is five times its complement. The angle measures

A. $25°$

B. $35°$

C. $65°$

D. $75°$

Answer

As we know that sum of two complementary – angles is 90^o.

So, $x + y = 90^o$

According to question $y = 5x$

$x + 5x = 90$

$6x = 90^o$

$x = 15^o$

$y = 75^o$

6. Question

Two complementary angles are such that twice the measure of the one is equal to three times the measure of the other. The larger of the two measures

A. 72°

B. 54°

C. 63°

D. 36°

Answer

As we know that sum of two complementary – angles is 90^o.

So, $x + y = 90^o$

Let x be the common multiple.

According to question angles would be 2x and 3x.

$2x + 3x = 90$

$5x = 90^o$

$x = 18^o$

$2x = 36^o$

$3x = 54^o$

So, larger angle is 54^o

7. Question

Two straight lines AB and CD cut each other at O. If ∠BOD = 63°, then ∠BOD = ?

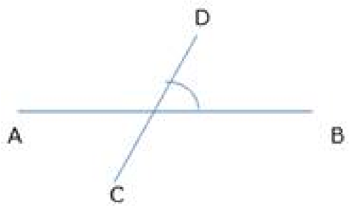
A. 63°

B. 117°

C. 17°

D. 153°

Answer



$\angle BOD = 63^\circ$

As we know that sum of adjacent angle on a straight line is 180^o.

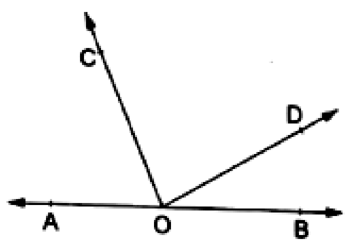
$\angle BOD + \angle BOC = 180^\circ$

$\angle BOC = 180^\circ - 63^\circ$

$\angle BOC = 117^\circ$

8. Question

In the given figure, AOB is a straight line. If $\angle AOC + \angle BOD = 95^\circ$, then $\angle COD$ = ?



A. 95°

B. 85°

C. 90°

D. 55°

Answer

As we know that sum of adjacent angle on a straight line is 180^o.

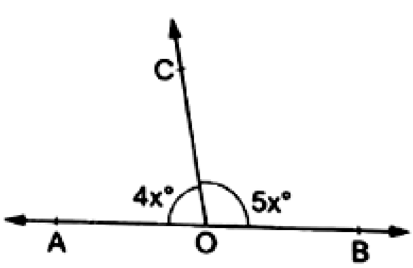
$\angle AOC + \angle BOD + \angle COD = 180^o$

$\angle COD = 180^o - 95^o$

$\angle COD = 85^o$

9. Question

In the given figure, AOB is a straight line. If $\angle AOC = 4x^\circ$ and $\angle BOC = 5x^\circ$, then $\angle AOC$ = ?



A. 40°

B. 60°

C. 80°

D. 100°

Answer

As we know that sum of adjacent angle on a straight line is 180^{o}.

According to question,

$\angle AOC = 4x^{o}$

$\angle BOC = 5x^{o}$,

$4x + 5x = 180^{o}$

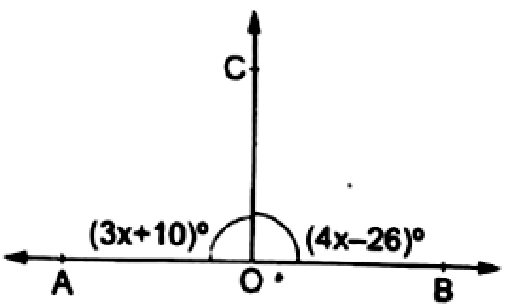
$9x = 180^{o}$

$X = 20^{o}$

$\angle AOC = 4x^{o} = 80^{o}$

10. Question

In the given figure, AOB is a straight line. If ∠AOC (3x + 10)° and ∠BOC = (4x – 26)°, then ∠BOC = ?



A. 96°

B. 86°

C. 76°

D. 106°

Answer

As we know that sum of adjacent angle on a straight line is 180^{o}.

According to question,

$\angle AOC = (3x + 10)°$

$\angle BOC = (4x - 26)°$

$3x + 10 + 4x - 26 = 180^{o}$

$7x - 16 = 180^{o}$

$7x = 196^{o}$

X= 28°

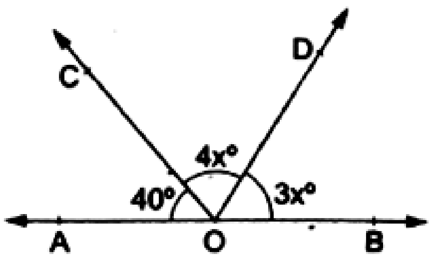
∠ BOC = (4x – 26)°

∠ BOC = 112° – 26°

∠ BOC = 86°

11. Question

In the given figure, AOB is a straight line. If ∠AOC = 40°, ∠COD = 4x°, and ∠BOD = 3x°, then ∠COD = ?



A. 80°

B. 100°

C. 120°

D. 140°

Answer

As we know that sum of all angles on a straight line is 180°

∠ AOC + ∠COD + ∠BOD = 180°

$$\angle AOC + \angle COD + \angle BOD = 180^\circ$$

$$40^\circ + 4x + 3x = 180^\circ$$

$$7x = 140^\circ$$

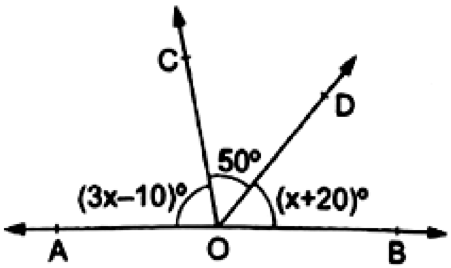
$$x = 20^\circ$$

So,

$$\angle COD = 4x = 80^\circ$$

12. Question

In the given figure, AOB is a straight line. If ∠AOC = (3x – 10)°, ∠COD = 50° and ∠BOD = (x + 20)°, then ∠AOC = ?



A. 40°

B. 60°

C. 80°

D. 50°

Answer

As we know that sum of all angles on a straight line is 180°.

$$\angle AOC + \angle COD + \angle BOD = 180^{\circ}$$

$$(3x - 10) + 50^{\circ} + (x + 20) = 180^{\circ}$$

$$4x + 10 = 130^{\circ}$$

$$4x = 120^{\circ}$$

$$x = 30^{\circ}$$

So,

$$\angle AOC = 3x - 10 = 90^{\circ} - 10^{\circ} = 80^{\circ}$$

13. Question

Which of the following statements is false?

A. Through a given point, only one straight line can be drawn.

B. Through two given points, it is possible to draw one and only one straight line.

C. Two straight lines can intersect only at one point.

D. A line segment can be produced to any desired length.

Answer

Through a given point, we can draw infinite number of lines.

14. Question

An angle is one – fifth of its supplement. The measure of the angle is

A. 15°

B. 30°

C. 75°

D. 150°

Answer

Let x be the common multiple.

According to question,

y= 5x

As we know that sum of two supplementary – angles is 180^{o}.

So, x + y = 180^{o}

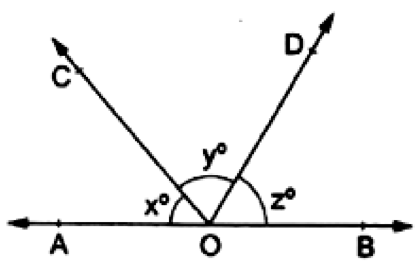
x + 5x= 180

6x = 180^{o}

x = 30^{o}

15. Question

In the adjoining figure, AOB is a straight line. If x : y : z = 4 : 5 : 6, then y = ?



A. 60°

B. 80°

C. 48°

D. 72°

Answer

Let n be the common multiple

$x : y : z = 4 : 5 : 6,$

As we know that sum of all angles on a straight line is 180^{o}.

4n + 5n + 6n =180^{o}

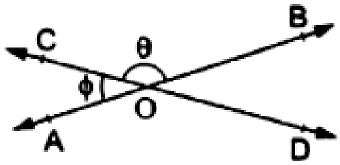
15n = 180^{o}

N = 12^{o}

Y = 5n = 60^{o}

16. Question

In the given figure, straight lines AB and CD intersect at O. If ∠AOC = ϕ, ∠BOC = θ and θ = 3θ, then θ = ?



A. 30°

B. 40°

C. 45°

D. 60°

Answer

As we know that sum of all angles on a straight line is 180°.

According to question,

$\theta = 3\phi,$

$\phi + \theta = 180^\circ$

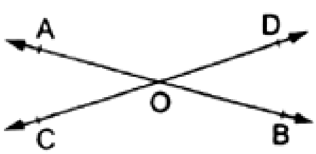
$\phi + 3\phi = 180^\circ$

$4\phi = 180^\circ$

$\phi = 45^\circ$

17. Question

In the given figure, straight lines AB and CD intersect at O. If ∠AOC + ∠BOD = 130°, then ∠AOD = ?



A. 65°

B. 115°

C. 110°

D. 125°

Answer

AC and BD intersect at O.

$\angle AOC = \angle BOD$

$\angle AOC + \angle BOD = 130^\circ$

$\angle BOD + \angle BOD = 130^\circ$

$2\angle BOD = 130^\circ$

$\angle BOD = 65^\circ$

As we know that sum of all angles on a straight line is 180°.

$\angle AOD + \angle BOD = 180^\circ$

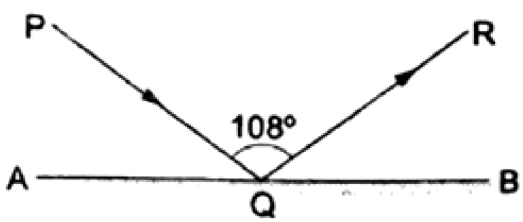
$\angle AOD + 65^\circ = 180^\circ$

$\angle AOD = 180^\circ - 65^\circ$

$\angle AOD = 115^\circ$

18. Question

In the given figure AB is a mirror, PQ is the incident ray and QR is the reflected ray. If ∠PQR = 108°, then ∠AQP = ?



A. 72°

B. 18°

C. 36°

D. 54°

Answer

Incident ray makes the same angle as reflected ray.

So,

$\angle AQP + \angle PQR + \angle BQR = 180^{0}$

$\angle AQP + \angle PQR + \angle AQP = 180^{0} (\angle AQP = \angle BQR)$

$2\angle AQP + 108^{0} = 180^{0}$

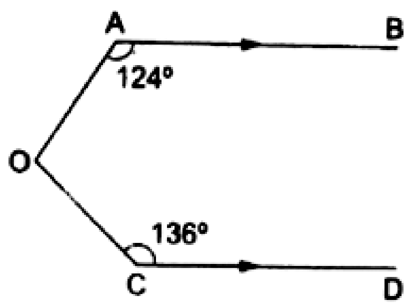
$2\angle AQP = 180^{0} - 108^{0}$

$2\angle AQP = 72^{0}$

$\angle AQP = 36^{0}$

19. Question

In the given figure AB || CD. If ∠OAB = 124°, ∠OCD = 136°, then ∠AOC = ?



A. 80°

B. 90°

C. 100°

D. 110°

Answer

Draw a line EF such that EF || AB and EF || CD crossing point O.

∠FOC + ∠OCD = 180^{0} (Sum of consecutive interior angles is 180^{0})

∠FOC = 180 – 136 = 44^{0}

EF || AB such that AO is traversal.

∠OAB + ∠FOA = 180^{0}(Sum of consecutive interior angles is 180^{0})

∠FOA = 180 – 124 = 56^{0}

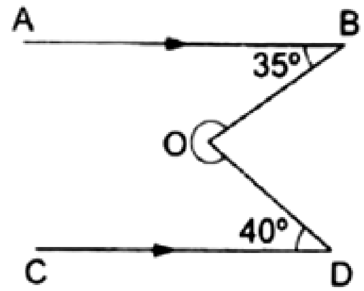
∠AOC = ∠FOC + ∠FOA

= 56 + 44

=100^{0}

20. Question

In the given figure AB || CD and O is a point joined with B and D, as shown in the figure such that ∠ABO = 35 and ∠CDO = 40°. Reflex ∠BOD = ?



A. 255°

B. 265°

C. 275°

D. 285°

Answer

Draw a line EF such that EF || AB and EF || CD crossing point O.

$\angle$ABO + $\angle$EOB = 180^{o}(Sum of consecutive interior angles is 180^{o})

$\angle$EOB = 180 – 35 = 145^{o}

EF || AB such that AO is traversal.

$\angle$CDO + $\angle$EOD = 180^{o}(Sum of consecutive interior angles is 180^{o})

$\angle$EOD = 180 – 40 = 140^{o}

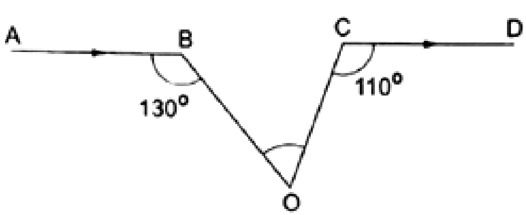
$\angle$BOD = $\angle$EOB + $\angle$EOD

= 145 + 140

= 285^{o}

21. Question

In the given figure, AB || CD. If ∠ABO = 130° and ∠OCD = 110°, then ∠BOC = ?



A. 50°

B. 60°

C. 70°

D. 80°

Answer

According to question,

AB || CD

AF || CD (AB is produced to F, CF is traversal)

$\angle$DCF= $\angle$BFC=110^{o}

Now, $\angle$BFC + $\angle$BFO = 180^{o}(Sum of angles of Linear pair is 180^{o})

$\angle$BFO = 180^{o} – 110^{o} = 70^{o}

Now in triangle BOF, we have

$\angle$ABO = $\angle$BFO + $\angle$BOF

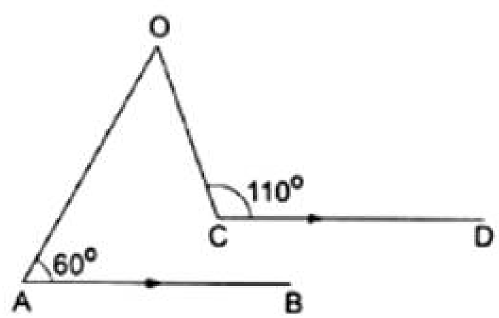
130 = 70 + $\angle$BOF

$\angle$BOF = 130 – 70 =60^{o}

So, $\angle$BOC = 60^{o}

22. Question

In the given figure, AB || CD. If ∠BAO = 60° and ∠OCD = 110°, then ∠AOC = ?



A. 70°

B. 60°

C. 50°

D. 40°

Answer

According to question,

AB || CD

AB || DF (DC is produced to F)

$\angle$OCD=110^{o}

$\angle$FCD = 180 – 110 = 70^{o}(linear pair)

Now in triangle FOC, we have

$\angle$FOC + $\angle$CFO + $\angle$OCF = 180^{o}

$\angle$FOC + 60 + 70 = 180^{o}

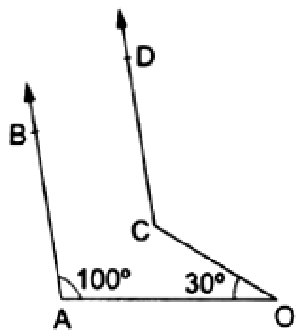
$\angle$FOC = 180 – 130

=50^{o}

So, $\angle$AOC = 50^{o}

23. Question

In the given figure, AB || CD. If ∠AOC = 30° and ∠OAB = 100°, then ∠OCD = ?



A. 130°

B. 150°

C. 80°

D. 100°

Answer

From O, draw E such that OE || CD || AB.

OE || CD and OC is traversal.

So,

$\angle$DCO + $\angle$COE = 180 (co –interior angles)

x + $\angle$COE = 180

$\angle$COE = (180 – x)

Now, OE || AB and AO is the traversal.

$\angle$BAO + $\angle$AOE = 180 (co –interior angles)

$\angle$BAO + $\angle$AOC + $\angle$COE = 180

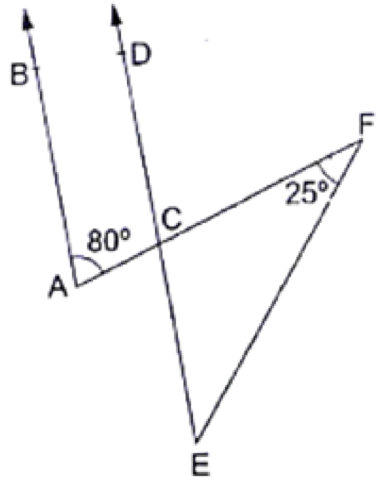
100 + 30 + (180 – x) = 180

180 – x = 50

X = 180 – 50 = 130^{O}

24. Question

In the given figure, AB || CD. If ∠CAB = 80° and ∠EFC = 25°, then ∠CEF = ?



A. 65°

B. 55°

C. 45°

D. 75°

Answer

AB || CD

$\angle$BAC = $\angle$DCF = 80°

$\angle$ECF + $\angle$DCF = 180° (linear pair of angles)

$\angle$ECF =100°

Now in triangle CFE,

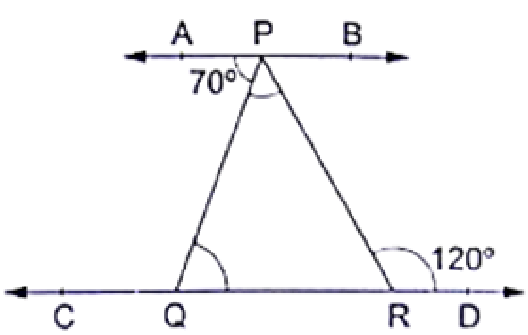
$\angle$ECF + $\angle$EFC + $\angle$CEF = 180°

$\angle$CEF = 180° – 100° – 25°

=55°

25. Question

In the given figure, AB || CD. If ∠APQ = 70° and ∠PRD = 120°, then ∠QPR = ?



A. 50°

B. 60°

C. 40°

D. 35°

Answer

$\angle PRD = 120^{\circ}$

$\angle PRQ = 180^{\circ} - 120^{\circ} = 60^{\circ}$

$\angle$APQ = $\angle$PQR = 70°

Now, in triangle PQR, we have

$\angle$PQR + $\angle$PRQ + $\angle$QPQ = 180°

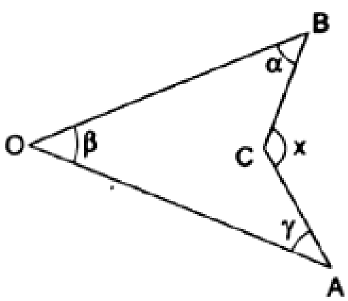
70 + 60 + $\angle$QPQ = 180°

$\angle$QPQ = 180° – 130°

= 50°

26. Question

In the given figure, x = ?



A. α + β – γ

B. α – β + γ

C. α + β + γ

D. α + γ – β

Answer

AC is produced to meet OB at D.

$\angle$OEC = 180 – $(\beta + \gamma)$

So, $\angle$BEC = 180 – (180 – $(\beta + \gamma)$) = $(\beta + \gamma)$

Now, x = $\angle$BEC + $\angle$CBE (Exterior Angle)

= $(\beta + \gamma)$ + α

= $\alpha + \beta + \gamma$

27. Question

If $3\angle A = 4\angle B = 6\angle C$, then A : B : C = ?

A. 3:4:6

B. 4:3:2

C. 2:3:4

D. 6:4:3

Answer

Let say $3\angle A = 4\angle B = 6\angle C = x$

$\angle A = x/3$

$\angle B = x/4$

$\angle C = x/6$

$\angle A + \angle B + \angle C = 180$

$x/3 + x/4 + x/6 = 180$

$(4x + 3x + 2x)/12 = 180$

$9x/12 = 180$

$X = 240$

$\angle A = x/3 = 240/3 = 80$

$\angle B = x/4 = 240/4 = 60$

$\angle C = x/6 = 240/6 = 40$

So, A:B:C = 4:3:2

28. Question

In ΔABC, if $\angle A + \angle B = 125°$ and $\angle A + \angle C = 113°$, then $\angle A$ = ?

A. (62.5°)

B. (56.5)°

C. 58°

D. 63°

Answer

$\angle A + \angle B + \angle C = 180$

$\angle C = 180 - 125 = 55^{o}$

$\angle A + \angle C = 113^{o}$

$\angle A = 113 - 55 = 58^{o}$

29. Question

In ΔABC, if ∠A – ∠B = 42° and ∠B – ∠C = 21°, then ∠B = ?

A. 95°

B. 53°

C. 32°

D. 63°

Answer

∠A = ∠B + 42

∠C = ∠B – 21

∠A + ∠B + ∠C = 180

∠B + 42 + ∠B + ∠B – 21 =180

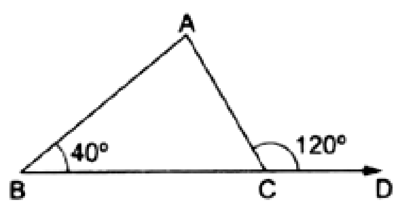
3∠B + 21 = 180

3∠B = 159

∠B = 53°

30. Question

In ΔABC, side BC is produced to D. If ∠ABC = 40° and ∠ACD = 120°, then ∠A = ?



A. 60°

B. 40°

C. 80°

D. 50°

Answer

∠ACD + ∠ACB = 180 (Linear pair of angles)

∠ACB = 60°

∠ABC = 40°

As we know that

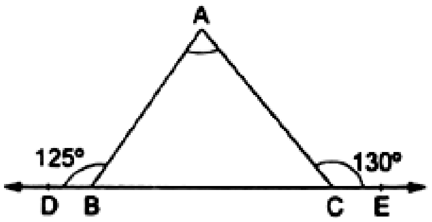
∠ACB + ∠ACB + ∠BAC = 180°

∠BAC = 180 – 60 – 40

$=80^{o}$

31. Question

Side BC of ΔABC has been produced to D on left hand side and to E on right hand side such that ∠ABD = 125° and ∠ACE = 130°. Then ∠A = ?



A. 65°

B. 75°

C. 50°

D. 55°

Answer

∠ABD + ∠ABC = 180 (Linear pair of angles)

∠ABC = $180^{o} - 125^{o} = 55^{o}$

∠ACE + ∠ACB = 180 (Linear pair of angles)

∠ACB = $180^{o} - 130^{o} = 50^{o}$

As we know that

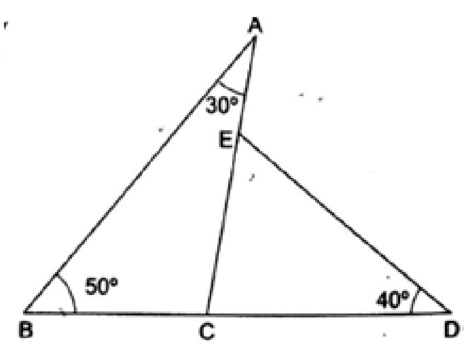
∠ACB + ∠ABC + ∠BAC = 180^{o}

∠BAC = 180 – 55 – 50

$=75^{o}$

32. Question

In the given figure, ∠BAC = 30°, ∠ABC = 50° and ∠CDE = 40°. Then ∠AED = ?



A. 120°

B. 100°

C. 80°

D. 110°

Answer

$\angle$ACB + $\angle$ABC + $\angle$BAC =180

$\angle$ACB = 180 – 50 – 30 = 100^{o}(Sum of angles of triangle is 180)

$\angle$ACB + $\angle$ACD = 180 (linear pair of angles)

$\angle$ACD = 180 – 100 = 80^{o}

In triangle ECD,

$\angle$ECD + $\angle$CDE + $\angle$DEC = 180

$\angle$DEC = 180 – 80 – 40

= 60^{o}

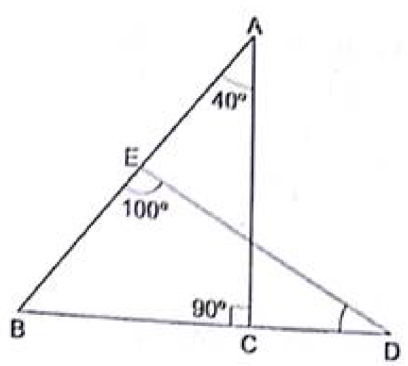
$\angle$DEC + $\angle$AED = 180^{o}(linear pair of angles)

$\angle$AED = 180^{o} – 60^{o}

= 120^{o}

33. Question

In the given figure, ∠BAC = 40°, ∠ACB = 90° and ∠BED = 100°. Then ∠BDE = ?



A. 50°

B. 30°

C. 40°

D. 25°

Answer

In triangle AEF,

$\angle$BED = $\angle$EFA + $\angle$EAF

$\angle$EFA = 100 – 40 = 60^{o}

$\angle$CFD = $\angle$EFA (vertical opposite angles)

$= 60^{o}$

In triangle CFD, we have

$\angle CFD + \angle FCD + \angle CDF = 180^{o}$

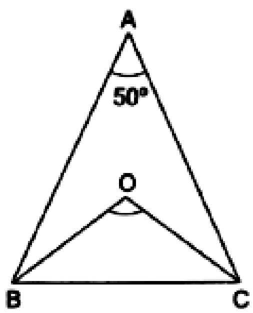
$\angle CDF = 180^{o} - 90^{o} - 60^{o}$

$= 30^{o}$

So, $\angle BDE = 30^{o}$

34. Question

In the given figure, BO and CO are the bisectors of $\angle B$ and $\angle C$ respectively. If $\angle A = 50°$, then $\angle BOC$ = ?



A. 130°

B. 100°

C. 115°

D. 120°

Answer

In ΔABC,

$\angle A + \angle B + \angle C = 180°$

$50° + \angle B + \angle C = 180°$

$\angle B + \angle C = 180° - 50° = 130°$

$\angle B = 65°$

$\angle C = 65°$

Now in ΔOBC,

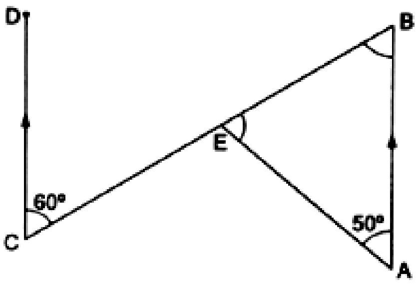
$\angle OBC + \angle OCB + \angle BOC = 180°$

$\angle BOC = 180° - 65°$ ($\angle OBC + \angle OCB = 65$ because O is bisector of $\angle B$ and $\angle C$)

$= 115°$

35. Question

In the given figure, AB || CD. If $\angle EAB = 50°$ and $\angle ECD = 60°$, then $\angle AEB$ = ?



A. 50°

B. 60°

C. 70°

D. 55°

Answer

AB || CD and BC is traversal.

So, ∠DCB = ∠ABC = 60^{o}

Now in triangle AEB, we have

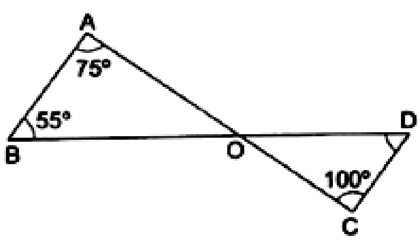
∠ABE + ∠BAE + ∠AEB =180^{o}

∠AEB =180^{o} – 60^{o} – 50^{o}

= 70^{o}

36. Question

In the given figure, ∠OAB = 75°, ∠OBA = 55° and ∠OCD = 100°. Then ∠ODC = ?



A. 20°

B. 25°

C. 30°

D. 35°

Answer

In triangle AOB,

∠AOB =180^{o} – 75^{o} – 55^{o}

= 50^{o}

∠AOB = ∠COD = 50^{o}(Opposite angles)

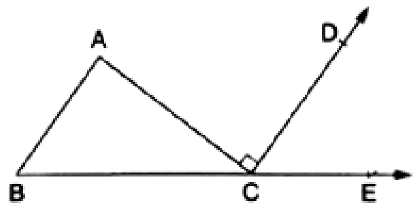
Now in triangle COD,

$\angle ODC = 180^o - 100^o - 50^o$

$= 30^o$

37. Question

In a ΔABC its is given that ∠A : ∠B : ∠C = 3 : 2 : 1 and CD ⊥ AC. Then ∠ECD = ?



A. 60°

B. 45°

C. 75°

D. 30°

Answer

As per question,

$$\angle A : \angle B : \angle C = 3 : 2 : 1$$

So,

$\angle A = 90^o$

$\angle B = 60^o$

$\angle C = 30^o$

$\angle ACB + \angle ACD + \angle ECD = 180^o$ (sum of angles on straight line)

$\angle ECD = 180^o - 90^o - 30^o$

$= 60^o$

38. Question

In the given figure, AB || CD. If ∠ABO = 45° and ∠COD = 100° then ∠CDO = ?

A. 25°

B. 30°

C. 35°

D. 45°

Answer

$\angle BOA = 100^o$ (Opposite pair of angles)

So,

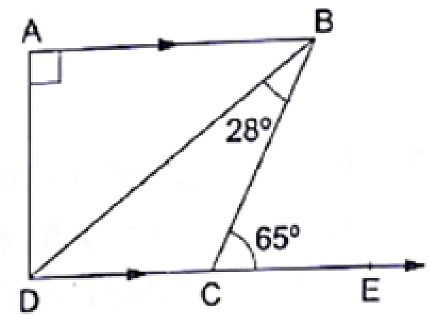
$\angle BAO = 180^o - 100^o - 45^o$

$= 35^o$

$\angle BAO = \angle CDO = 35^o$ (Corresponding Angles)

39. Question

In the given figure, AB || DC, ∠BAD = 90°, ∠CBD = 28° and ∠BCE = 65°. Then ∠ABD = ?



A. 32°

B. 37°

C. 43°

D. 53°

Answer

$\angle BCE = \angle ABC = 65^o$ (Alternate Angles)

$\angle ABC = \angle ABD + \angle DBC$

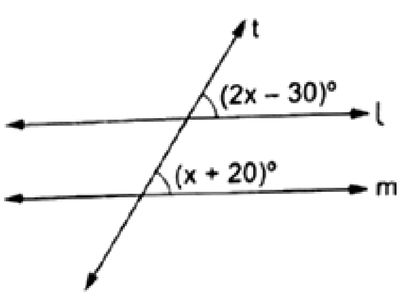
$65^o = \angle ABD + 28^o$

$\angle ABD = 65 - 28$

$= 37^o$

40. Question

For what value of x shall we have l || m?



A. x = 50

B. x = 70

C. x = 60

D. x = 45

Answer

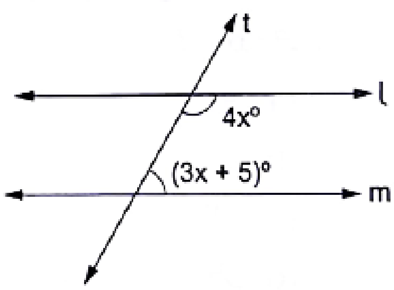
X + 20 = 2x – 30(Corresponding Angles)

2x –x = 30 + 20

X = 50^{o}

41. Question

For what value of x shall we have l || m?



A. x = 35

B. x = 30

C. x = 25

D. x = 20

Answer

4x + 3x + 5 = 180^{o} (Interior angles of same side of traversal)

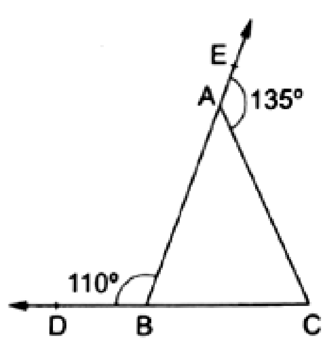
7x + 5 = 180^{o}

7x = 175

X = 25^{o}

42. Question

In the given figure, sides CB and BA of ΔABC have been produced to D and E respectively such that ∠ABD = 110° and ∠CAE = 135°. Then ∠ACB = ?



A. 35°

B. 45°

C. 55°

D. 65°

Answer

$\angle ABC = 180 - 110 = 70^0$ (Linear pair of angles)

$\angle BAC = 180 - 135 = 45^0$ (Linear pair of angles)

So,

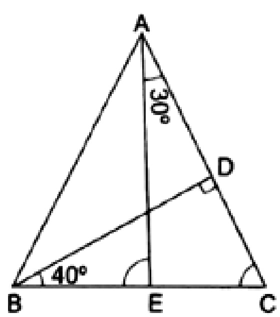
In Triangle ABC, we have

$\angle ABC + \angle BAC + \angle ACB = 180^o$

$\angle ACB = 180 - 70 - 45 = 65^0$

43. Question

In ΔABC, BD ⊥ AC, ∠CAE = 30° and ∠CBD = 40°. Then ∠AEB = ?



A. 35°

B. 45°

C. 25°

D. 55°

Answer

In triangle BDC,

$\angle B = 40$, $\angle D = 90$

So, $\angle C = 180 - (90 + 40)$

$= 50°$

Now in triangle AEC,

$\angle C = 50$, $\angle A = 30$

So, $\angle E = 180 - (50 + 30)$

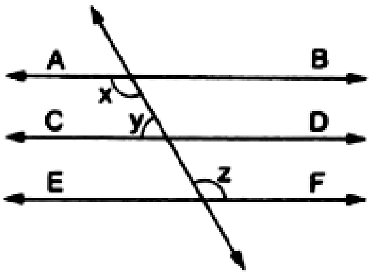
$= 100°$

Thus, $\angle AEB = 180 - 100$ (Sum of linear pair is 180°)

= 80°

44. Question

In the given figure, AB || CD, CD || EF and y : z = 3 : 7, then x = ?



A. 108°

B. 126°

C. 162°

D. 63°

Answer

Let n be the common multiple.

Y + Z = 180

3n + 7n = 180

N =18

So, y = 3n = 54^{o}

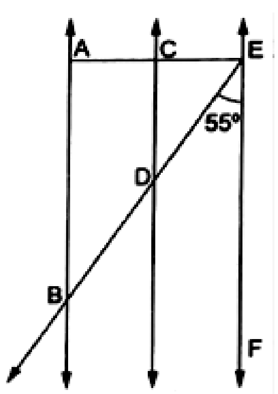
z = 7n = 126^{o}

x = z (Pair of alternate angles)

So, x = 126^{o}

45. Question

In the given figure, AB || CD || EF, EA ⊥ AB and BDE is the transversal such that ∠DEF = 55°. Then ∠AEB = ?



A. 35°

B. 45°

C. 25°

D. 55°

Answer

According to question

AB || CD || EF and

$EA \perp AB$

So, ∠D = ∠B (Corresponding angles)

According to question CD || EF and BE is the traversal then,

∠D + ∠E = 180 (Interior angle on the same side is supplementary)

So, ∠D = 180 – 55 = 125^{o}

And ∠B = 125^{o}

Now, AB || EF and AE is the traversal.

So, ∠BAE + ∠FEA = 180 (Interior angle on the same side of traversal is supplementary)

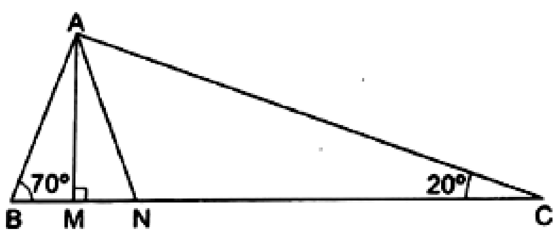
90 + x + 55 = 180

X + 145 = 180

X= 180 – 145 = 35^{o}

46. Question

In the given figure, AM ⊥ BC and AN is the bisector of ∠A. If ∠ABC = 70° and ∠ACB = 20°, then ∠MAN = ?



A. 20°

B. 25°

C. 15°

D. 30°

Answer

In triangle ABC,

∠B = 70^{o}

∠C = 20^{o}

So, ∠A = 180^{o} – 70^{o} – 20^{o} = 90^{o}

According to question, AN is bisector of ∠A

So, $\angle BAN = 45^{o}$

Now, in triangle BAM,

$\angle B = 70^{o}$

$\angle M = 90^{o}$

$\angle BAM = 180^{o} - 70^{o} - 90^{o} = 20^{o}$

Now, $\angle MAN = \angle BAN - \angle BAM$

$= 45^{o} - 20^{o}$

$= 25^{o}$

47. Question

An exterior angle of a triangle is 110° and one of its interior opposite angles is 45°, then the other interior opposite angle is

A. 45°

B. 65°

C. 25°

D. 135°

Answer

Exterior angle formed when the side of a triangle is produced is equal to the sum of the interior opposite angles.

Exterior angle = 110°

One of the interior opposite angles = 45°

Let the other interior opposite angle = x

$110° = 45° + x$

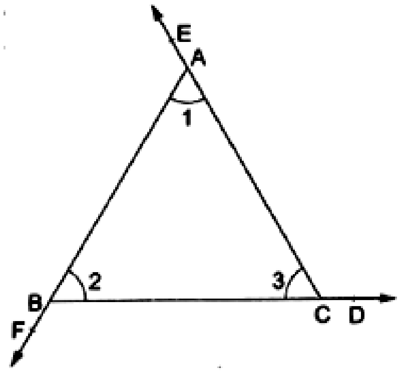
$x = 110° - 45°$

$x = 65°$

Therefore, the other interior opposite angle is 65°.

48. Question

The sides BC, CA and AB of ΔABC have been produced to D, E and F respectively as shown in the figure, forming exterior angles ∠ACD, ∠BAE and ∠CBF. Then, ∠ACD + ∠BAE + ∠CBF = ?



A. 240°

B. 300°

C. 320°

D. 360°

Answer

In Δ ABC,

we have CBF = 1 + 3 ...(i) [exterior angle is equal to the sum of opposite interior angles] Similarly, ACD = 1 + 2 ...(ii)

and BAE = 2 + 3 ...(iii)

On adding Eqs. (i), (ii) and (iii),

we get CBF + ACD + BAE =2[1 + 2 + 3] = 2 × 180° = 4 × 90°

[by angle sum property of a triangle is 180°] CBF + ACD + BAE = 4 right angles

Thus, if the sides of a triangle are produced in order, then the sum of exterior angles so formed is equal to four right angles = 360°

49. Question

The angles of a triangle are in the ratio 3:5:7. The triangle is

A. acute angled

B. right – angled

C. obtuse angled

D. isosceles

Answer

Let x be the common multiple.

3x + 5x + 7x = 180

15x = 180

x = 180/15

x = 123x = 3 X 12 = 36

5x = 5 X 12 = 60

$7x = 7 \times 12 = 84$

Since, all the angles are less than 90^o. So, it is acute angled triangle.

50. Question

If the vertical angle of a triangle is 130°, then the angle between the bisectors of the base angles of the triangle is

A. 65°

B. 100°

C. 130°

D. 155°

Answer

Let x and y be the bisected angles.

So in the original triangle, sum of angles is

$130 + 2x + 2y = 180$

$2(x + y) = 50$

$x + y = 25$

In the smaller triangle consisting of the original side opposite 130 and the 2 bisectors,

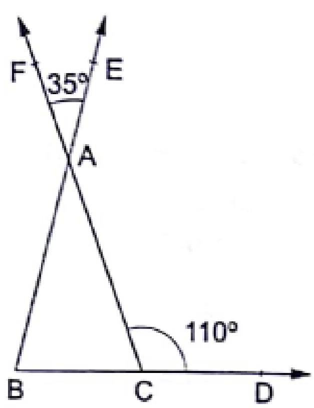
x + y + Base Angle = 180

25 + Base Angle = 180

Base Angle = 155^o

51. Question

The sides BC, BA and CA of ΔABC have been produced to D, E and F respectively, as shown in the given figure. Then, ∠B = ?



A. 35^o

B. 55^o

C. 65^o

D. 75^o

Answer

BAC = 35^o (opposite pair of angles)

BCD = 180 – 110 = 70^o (linear pair of angles)

Now, in Triangle ABC we have,

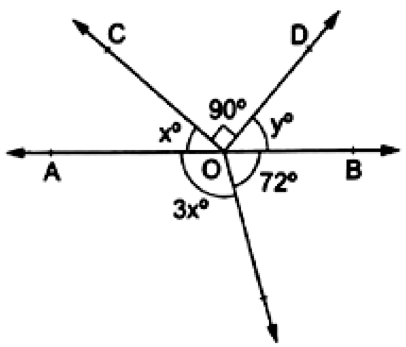
A + B + C = 180^o

35 + B + 70 = 180

B = 180 – 105 = 75^o

52. Question

In the adjoining figure, y = ?



A. 36°

B. 54°

C. 63°

D. 72°

Answer

x + y + 90 = 180 (sum of angles on a straight line)

x + y = 90 …………………(i)

3x + 72 = 180 (sum of angles on a straight line)

3x = 108

x = 108/3 =36^O

Putting this value in eq (i), we get

x + y = 90

36 + y = 90

Y = 90 – 36 = 54^O

53. Question

Each question consists of two statements, namely, Assertion (A) and Reason (R). Choose the correct option.

Assertion (A)	Reason (R)
If the two angles of a triangle measure 50° and 70°, then its third angle is 60°.	The sum of the angles of a triangle is 180°.

A. Both Assertion (A) and Reason (R) are true and Reason (R) is a correct explanation of Assertion (A).

B. Both Assertion (A) and Reason (R) are true but Reason (R) is not a correct explanation of Assertion (A).

C. Assertion (A) is true and Reason (R) is false.

D. Assertion (A) is false and Reason (R) is true.

Answer

Sum of triangle is = 180°

And 70 + 60 + 50 = 180°

54. Question

Each question consists of two statements, namely, Assertion (A) and Reason (R). Choose the correct option.

Assertion (A)	Reason (R)
If a ray $\overrightarrow{CD}$ stands on a line $\overrightarrow{AB}$ such that $\angle ACD = \angle BCD$, then $\angle ACD = 90°$.	If a ray $\overrightarrow{CD}$ stands on a line $\overrightarrow{AB}$, then $\angle ACD + \angle BCD = 180°$.

A. Both Assertion (A) and Reason (R) are true and Reason (R) is a correct explanation of Assertion (A).

B. Both Assertion (A) and Reason (R) are true but Reason (R) is not a correct explanation of Assertion (A).

C. Assertion (A) is true and Reason (R) is false.

D. Assertion (A) is false and Reason (R) is true.

Answer

According to linear pair of angle, sum of angles on straight line is 180

And 90 + 90 = 180^{o}

55. Question

Each question consists of two statements, namely, Assertion (A) and Reason (R). Choose the correct option.

Assertion (A)	Reason (R)
If the side BC of a ΔABC is produced to D, then $\angle ACD = \angle A + \angle B$.	The sum of the angles of a triangle is $180°$.

A. Both Assertion (A) and Reason (R) are true and Reason (R) is a correct explanation of Assertion (A).

B. Both Assertion (A) and Reason (R) are true but Reason (R) is not a correct explanation of Assertion (A).

C. Assertion (A) is true and Reason (R) is false.

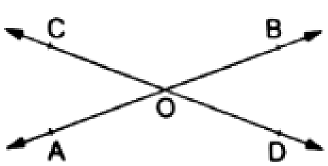
D. Assertion (A) is false and Reason (R) is true.

Answer

No, this is not linked with the given reason.

56. Question

Each question consists of two statements, namely, Assertion (A) and Reason (R). Choose the correct option.

Assertion (A)	Reason (R)
If two lines AB and CD intersect at O such that $\angle AOC = 40°$, then $\angle BOC = 140°$. 	If two straight lines intersect each other, then vertically opposite angles are equal.

A. Both Assertion (A) and Reason (R) are true and Reason (R) is a correct explanation of Assertion (A).

B. Both Assertion (A) and Reason (R) are true but Reason (R) is not a correct explanation of Assertion (A).

C. Assertion (A) is true and Reason (R) is false.

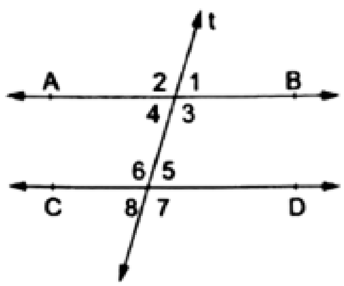
D. Assertion (A) is false and Reason (R) is true.

Answer

Because when two lines intersect each other, then vertically opposite angles are always equal.

57. Question

Each question consists of two statements, namely, Assertion (A) and Reason (R). Choose the correct option.

Assertion (A)	Reason (R)
If AB || CD and t is the transversal as shown, then ∠3 = ∠5. 	If a ray stands on a straight line the sum of the adjacent angles so formed is 180°.

A. Both Assertion (A) and Reason (R) are true and Reason (R) is a correct explanation of Assertion (A).

B. Both Assertion (A) and Reason (R) are true but Reason (R) is not a correct explanation of Assertion (A).

C. Assertion (A) is true and Reason (R) is false.

D. Assertion (A) is false and Reason (R) is true.

Answer

3 and 5 are pair of consecutive interior angles. It is not necessary to be always equal.

58. Question

Match the following columns:

Column I	Column II
(a) If x° and y° be the measures of two complementary angles such that 2x = 3y, then x=………..	(p) 45º
(b) If an angle is the Supplement of itself, then then the measure of the angle is ………….	(q) 60º
(c) If an angle is the complement of itself, then the measure of the angle is………….	(r) 54º
(d) If x° and y° be the angles forming a linear pair such that x – y = 60°, then y = …	(s) 90º

The correct answer is:

A. – ……., B. – ……….,

C. – ………, D. – ……….,

Answer

(a) – (r), (b) – (s), (c) – (p), (d) – (q)

(a) – (r)

X + y = 90

X + 2x/3 = 90

5x/3 = 90

X = 270/5

= 54

(b) – (s)

X + y = 180 (according to question x =y)

X + x = 180

2x = 180

X = 90

(c) – (p)

X + y = 90 (according to question x =y)

X + x = 90

2x = 90

X = 45

(d) – (q)

X + y = 180 (linear pair of angles) ……………………….(i)

X – y =60 (according to question) …………………….. (ii)

Adding (i) and (ii) we get,

2x = 240

X = 120

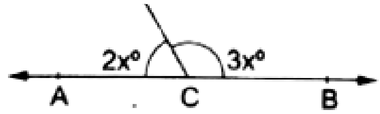
Now putting this in (ii) we get,

Y = 120 – 60 = 60

59. Question

Match the following columns:

Column I	Column II
(a) In the given figure, ABC is a straight line. Then, ∠ACD = ….. 	(p) 110°

<table>
<tr>
<td>
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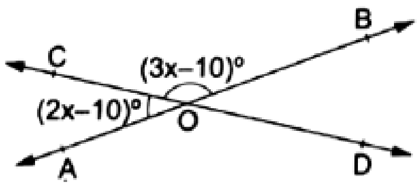
<tr>
<td>(b) In the given figure, ∠AOC = (2x – 10)° and ∠BOC = (3x – 10)°. Then, ∠AOD = …

</td>
<td>(q) 85°</td>
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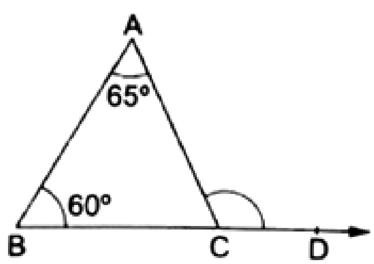
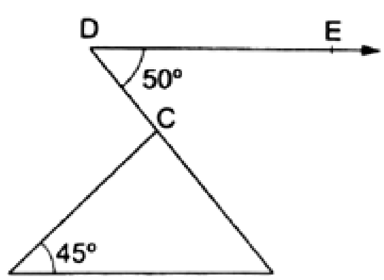
<tr>
<td>(c) In the given figure, side

BC of ΔABC has been produced to D. If ∠A = 65° and ∠B = 60°, then ∠ACD = ?

</td>
<td>(r) 72°</td>
</tr>
<tr>
<td>(d) In the given figure, AB || DE, ∠CDE = 50° and ∠BAC = 45°, then ∠ACB = ….

</td>
<td>(s) 125°</td>
</tr>
</table>

A B	

The correct answer is:

A. – ……., B. – ………,

C. – ………, D. – ………,

Answer

(a) – (r), (b) – (p), (c) – (s), (d) – (q)

(a) – (r)

2x + 3x = 180 (linear pair of angles)

5x =180

X = 36

2x = 2 X 36 = 72

(b) – (p)

2x – 10 + 3x – 10 = 180 (linear pair of angles)

5x – 20 =180

5x = 200

x = 40

AOD = 3x – 10 (opposite angles are equal)

= 120 – 10

= 110

(c) – (s)

C = 180 – (A + B) (sum of angles triangle is 180)

= 180 – (60 + 65)

= 55

ACD = 180 – 55 (sum of linear pair of angles is 180)

= 180 – 55

= 125

(d) – (q)

B = D) (alternate interior angles)

= 55

ACB = 180 – (55 + 40) (sum of angles of triangle is 180)

= 180 – 95

= 85

Formative Assessment (Unit Test)

1. Question

The angles of a triangle are in the ratio 3:2:7. Find the measure of each of its angles.

Answer

Let x be the common multiple.

$3x + 2x + 7x = 180$

$12x = 180$

$X = 15$

$3x = 45^{o}$

$2x = 30^{o}$

$7x = 105^{o}$

2. Question

In a ΔABC, if ∠A – ∠B = 40° and ∠B – ∠C = 10°, find the measure of ∠A, ∠B and ∠C.

Answer

$A = B + 40$

$C = B - 10$

$A + B + C = 180$

$B + 40 + B + B - 10 = 180$

$3B + 30 = 180$

$3B = 180 - 30 = 150$

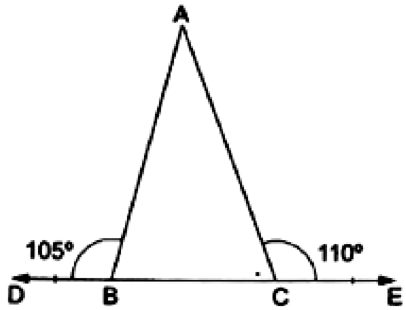
$B = 50^{O}$

So, $A = B + 40 = 90^{O}$

$C = B - 10 = 40^{O}$

3. Question

The side BC of ΔABC has been increased on both sides as shown. If ∠ABD = 105° and ∠ACE = 110°, then find ∠A.



Answer

B = 180 – 105 (sum of linear pair of angles is 180)

= 75

C = 180 – 110 (sum of linear pair of angles is 180)

= 70

So, A = 180 – (B + C) (sum of angles of triangle is 180)

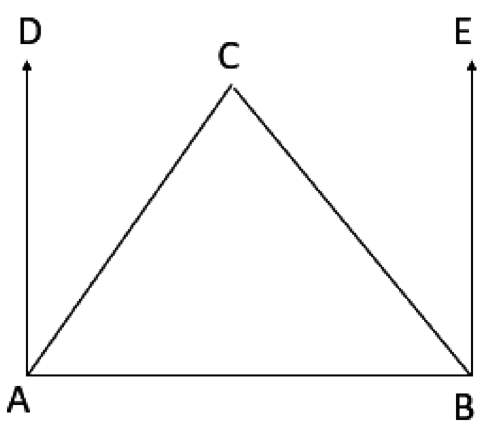
= 180 – (70 + 75)

= 35^{O}

4. Question

Prove that the bisectors of two adjacent supplementary angles include a right angle.

Answer



Given, ∠ DAB + EBA = 180°. CA and CB are bisectors of ∠ DAB ∠ EBA respectively.∴ ∠ DAC + ∠ CAB = 1/2 (∠ DAB).....(1)⇒ ∠ EBC + ∠ CBA = 1/2 (∠ EBA)....(2)⇒ ∠ DAB + ∠ EBA = 180°⇒ 2 (∠ CAB) + 2 (∠ CBA) = 180° [using (1) and (2)]⇒ ∠ CAB + ∠ CBA = 90°

In Δ ABC,

∠ CAB + ∠ CBA + ∠ ABC = 180° (Angle Sum property)⇒ 90° + ∠ ABC = 180°⇒ ∠ ABC = 180° - 90°⇒ ∠ ABC = 90°

5. Question

If one angle of a triangle is equal to the sum of the two other angles, show that the triangle is right – angled.

Answer

Let $\angle A$ = x, ∠B = y and ∠C = z

$\angle A$ + ∠B + ∠C = 180 (sum of angles of triangle is 180)

x + y + z = 180 ……………i)

According to question,

x = y + z …………(ii)

Adding eq (i) and (ii), we get

x + x = 180

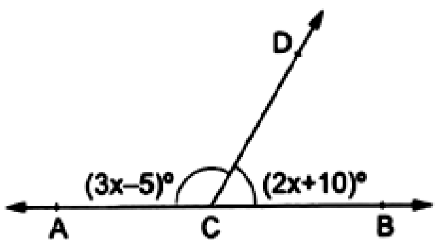
2x = 180

X = 90

Hence, It is a right angled triangle.

6. Question

In the given figure, ACB is a straight line and CD is a line segment such that ∠ACD = (3x – 5)° and ∠BCD = (2x + 10)°. Then, x = ?



A. 25

B. 30

C. 35

D. 40

Answer

3x – 5 + 2x + 10 = 180 (linear pair of angles)

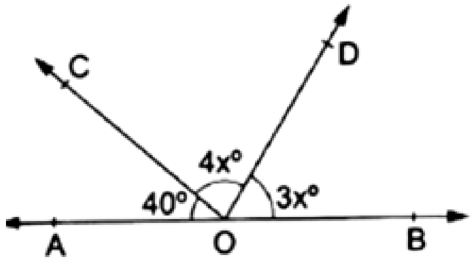
5x + 5 =180

5x = 175

X = 175/ 5 = 35

7. Question

In the given figure, AOB is a straight line. If ∠AOC = 40°, ∠COD = 4x° and ∠BOD = 3x°, then x = ?



A. 20

B. 25

C. 30

D. 35

Answer

40 + 4x + 3x = 180 (sum of angles on a straight line)

7x + 40 =180

7x = 180 – 40

X = 140/ 7 = 20

8. Question

The supplement of an angle is six times its complement. The measure of this angle is

A. 36°

B. 54°

C. 60°

D. 72°

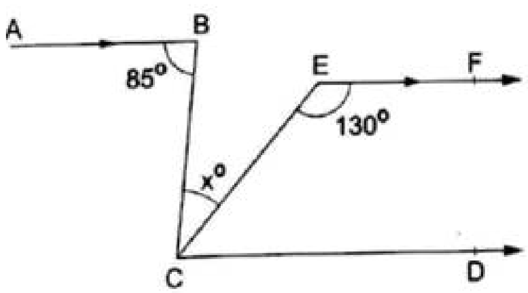
Answer

Let x be the angle then,complement = 90 – xsupplement = 180 – x

According to question,180 – x = 6(90 – x)180 – x = 540 – 6x180 + 5x = 5405x = 360x = 72^{O}

9. Question

In the given figure, AB || CD || EF. If ∠ABC = 85°, ∠BCE = x° and ∠CEF = 130°, then x = ?



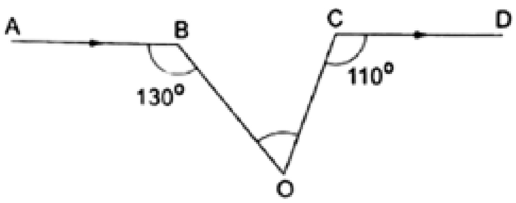
A. 30

B. 25

C. 35

D. 15

Answer



According to question,

AB || EF

EF || CD (AB is produced to F, CF is traversal)

∠FEC=130°

Now, ∠BFC + ∠BFO = 180°(Sum of angles of Linear pair is 180°)

∠BFO = 180° – 130° = 50°

Now in triangle BOF, we have

∠ABO = ∠BFO + ∠BOF

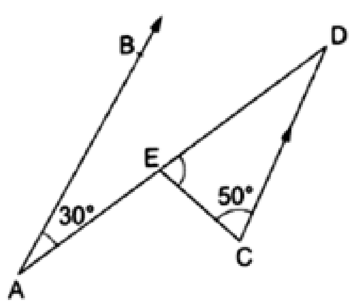
85 = 50 + ∠BOF

∠BOF = 85 – 50 =35°

So, x = °

10. Question

In the given figure, AB || CD, ∠BAD = 30° and ∠ECD = 50°. Find ∠CED.



Answer

∠A = ∠D (Pair of alternate angles)

= 30°

Now, in triangle EDC we have

∠D = 30° and ∠C = 50°

So,

$\angle$CED = 180 – ($\angle$C + $\angle$D)

= 180 – 30 – 50

=100^O

11. Question

In the given figure, BAD || EF, ∠AEF = 55° and ∠ACB = 25°, find ∠ABC.

Answer

According to question EF || BAD

Producing E to O, we get

$\angle$EFA + $\angle$AEO = 180 (Linear pair of angles)

$\angle$AEO = 180 – 55

= 125

Now, in triangle ABC we get,

$\angle$A = 125 and $\angle$C = 25

So, $\angle$ABC = 180 – ($\angle$A + $\angle$C)

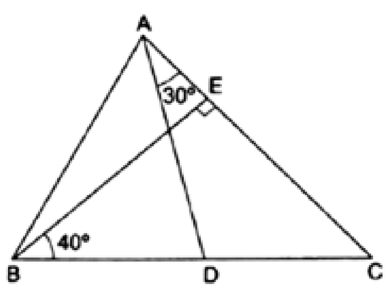
= 180 – (125 + 25)

= 180 – 150

= 30^O

12. Question

In the given figure, BE ⊥ AC, ∠DAC = 30° and ∠DBE = 40°. Find ∠ACB and ∠ADB.



Answer

In triangle BEC we have,

$\angle$B = 40^O and $\angle$E = 90^O

So, $\angle$C = 180^O – (90 + 40)

=50^O

Therefore, $\angle$ACB = 50^O

Now intriangle ADC we have,

$\angle A = 30^{O}$ and $\angle C = 50^{O}$

So, $\angle D = 180^{O} - (30 + 50)$

$=100^{O}$

Therefore,

$\angle ADB + \angle ADC = 180$ (sum of angles on straight line)

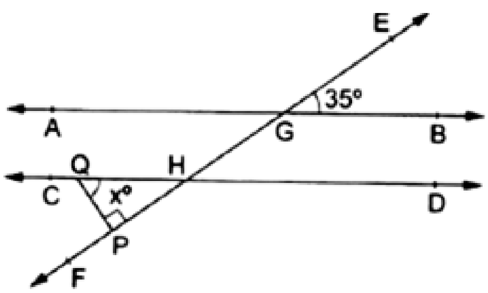
$\angle ADB + 100 = 180$

$\angle ADB = 180 - 100$

$= 80^{O}$

13. Question

In the given figure, AB || CD and EF is a transversal, cutting them at G and H respectively. If $\angle EGB = 35°$ and $QP \perp EF$, find the measure of $\angle PQH$.



Answer

$\angle EGB = \angle QHP$ (Alternate Exterior Angles) $= 35^{O}$

$\angle QPH = 90^{O}$

So, in triangle QHP we have,

$\angle QPH + \angle QHP + \angle PQH = 180^{O}$

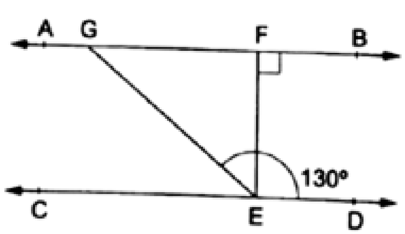
$90^{O} + 35^{O} + \angle PQH = 180^{O}$

$\angle PQH = 180^{O} - 90^{O} - 35^{O}$

$= 55^{O}$

14. Question

In the given figure, AB || CD and $EF \perp AB$. If EG is the transversal such that $\angle GED = 130°$, find $\angle EGF$.



Answer

$\angle$GEC = 180 – 130 = 50^{O} (linear pair of angles)

According to question,

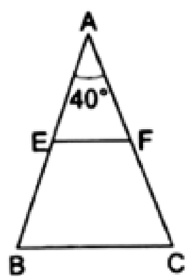
AB || CD and EF is perpendicular to AB.

$\angle$GEC = $\angle$EGF (pair of alternate interior angles)

= 50^{O}

15. Question

Match the following columns:

Column I	Column II
(a) An angle is 10° more than its complement. The measure of the angle is....	(p) 160°
(b) In ΔABC, ∠A = 65° and ∠B – ∠C = 25°, then ∠B = ...	(q) 50°
(c) In ΔABC, ∠A = 40° and ∠B = ∠C? If EF || BC, then ∠EFC = ... 	(r) 70°
(d) If the angles around a point are 2x °, 3x°, 5x° and 40° then the measure of largest angle is..........	(s) 110°

The correct answer is:

A. – ……., B. – ……….,

C. – ………, D. – ……….,

Answer

(a) – (q), (b) – (r), (c) – (s), (d) – (p)

(a) – (q)

$x + x + 10 = 90$

$2x + 10 = 90$

$2x = 80$

$x = 40$

$x + 10 = 50^{O}$

(b) – (r)

$\angle A + \angle B + \angle C = 180$

$65 + \angle B + \angle B - 25 = 180$

$2\angle B + 40 = 180$

$2\angle B = 140$

$\angle B = 70^{O}$

(d) – (p)

$\angle A + \angle B + \angle C + \angle D = 360$

$2x + 3x + 5x + 40 = 360$

$10x + 40 = 360$

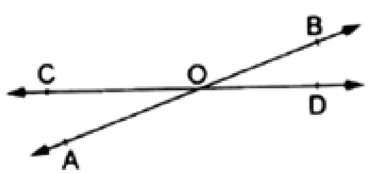
$10x = 320$

$X = 32^{O}$

$5x = 32 X 5 = 160^{O}$

16 A. Question

In the given figure, lines AB and CD intersect at O such that ∠AOD + ∠BOD + ∠BOC = 300°. Find ∠AOD.



Answer

According to question,

$$\angle AOD + \angle BOD + \angle BOC = 300^{o}.$$

In the given figure CD is a straight line.

As we know, Sum of angle on a straight line is 180^{O}

S0,

AOD + BOD + BOC =300

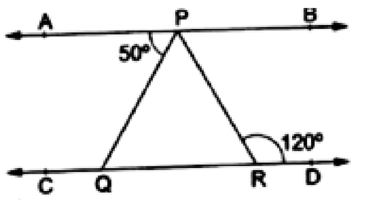
AOD + 180 =300

AOD =300 – 180

= 120^{O}

16 B. Question

In the given figure AB || CD, ∠APQ = 50° and ∠PRD = 120°. Find ∠QPR.



Answer

According to question,

PRD = 120^{O}

PRD = APR (Pair of alternate interior angles)

So,

APR = 120

APQ + QPR = 120

50 + QPR = 120

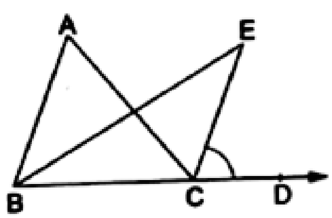
QPR = 120 – 50

= 70^{O}

17. Question

In the given figure, BE is the bisector of ∠B and CE is the bisector of ∠ACD.

Prove that



Answer

In triangle ABC we have,

A + B + C = 180

Let B = x and C = y then,

A + 2x + 2y = 180 (BE and CE are the bisector of angles B and C respectively.)

x + y + A = 180

A = 180 – (x + y) ………….(i)

Now, in triangle BEC we have,

B = x/2

C = y + ((180 – y) / 2)

= (180 + y) / 2

B + C + BEC = 180

x/2 + (180 + y) / 2 + BEC = 180

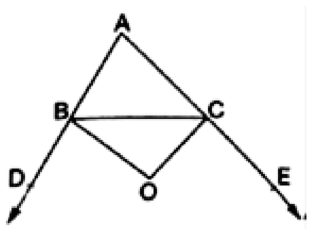
BEC = (180 – x – y) /2 ………..(ii)

From eq (i) and (ii) we get,

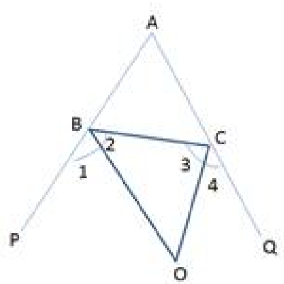
BEC = A/2

18. Question

In ΔABC, sides AB and AC are produced to D and E respectively. BO and CO are the bisectors of ∠CBD and ∠BCE respectively. Then, prove that



Answer



Here BO, CO are the angle bisectors of ∠DBC &∠ECB intersect each other at O.

∴∠1 = ∠2 and ∠3 = ∠4

Side AB and AC of ΔABC are produced to D and E respectively.

∴ Exterior of ∠DBC = ∠A + ∠C ………… (1)

And Exterior of ∠ECB = ∠A + ∠B ………… (2)

Adding (1) and (2) we get

∠DBC + ∠ECB = 2 ∠A + ∠B + ∠C.

2∠2 + 2∠3 = ∠A + 180°

∠2 + ∠3 = (1 /2)∠A + 90° ………… (3)

But in a ΔBOC = ∠2 + ∠3 + ∠BOC = 180° ………… (4)

From eq (3) and (4) we get

(1 /2)∠A + 90° + ∠BOC = 180°

∠BOC = 90° – (1 /2)∠A

19. Question

Of the three angles of a triangle, one is twice the smallest and another one is thrice the smallest. Find the angles.

Answer

Let x be the common multiple.

So, angles will be x, 2x and 3x

X + 2x + 3x = 180

6x = 180

X =30

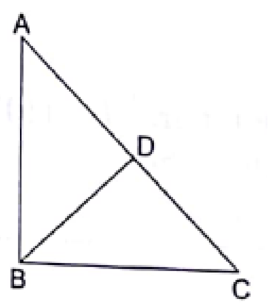
2x = 2 X 30 = 60

3x = 3 X 30 = 90

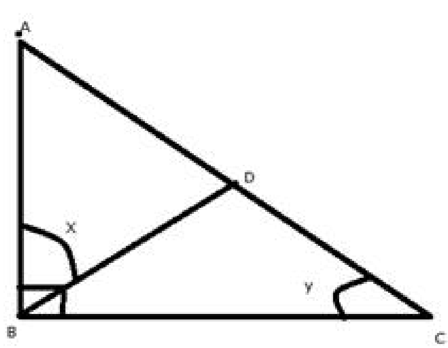
So, Angles are 30^{O},60^{O} and 90^{O}

20. Question

In ΔABC, ∠B = 90° and BD ⊥ AC. Prove that ∠ABD = ∠ACB.



Answer



Let ∠ABD = x and ∠ACB = y

According to question,

$\angle B = 90^{O}$

In triangle BDC, we have,

$\angle BDC = 90^{O}$

$\angle DBC = (90 - x)^{O}$

$\angle BDC + \angle DBC + \angle DCB = 180^{O}$

$90^{O} + (90 - x)^{O} + y = 180^{O}$

$180^{O} - x + y = 180^{O}$

$x = y$

So,

$\angle ABD = \angle ACB$