4. Geometry

Exercise 4.1

1. Question

Find the complement of each of the following angles.

i. 63° ii. 24°

iii. 48° iv. 35°

v. 20°

Answer

i. We know that two angles are said to be complementary if their sum is 90°.

So, the complement of 63° = 90° - 63° = 27°

ii. We know that two angles are said to be complementary if their sum is 90°.

So, the complement of 24° = 90° - 24° = 66°

iii. We know that two angles are said to be complementary if their sum is 90°.

So, the complement of 48° = 90° - 48° = 42°

iv. We know that two angles are said to be complementary if their sum is 90°.

So, the complement of 35° = 90° - 35° = 55°

v. We know that two angles are said to be complementary if their sum is 90°.

So, the complement of 20° = 90° - 20° = 70°

2. Question

Find the supplement of each of the following angles.

i. 58° ii. 148°

iii. 120° iv. 40°

v. 100°

Answer

i. We know that two angles are said to be supplementary if their sum is 180°.

So, the supplement of 58° = 180° - 58° = 122°

ii. We know that two angles are said to be supplementary if their sum is 180°.

So, the supplement of 148° = 180° - 148° = 32°

iii. We know that two angles are said to be supplementary if their sum is 180°.

So, the supplement of 120° = 180° - 120° = 60°

iv. We know that two angles are said to be supplementary if their sum is 180°.

So, the supplement of 40° = 180° - 40° = 140°

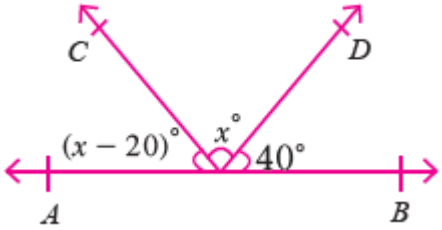
v. We know that two angles are said to be supplementary if their sum is 180°.

So, the supplement of 100° = 180° - 100° = 80°

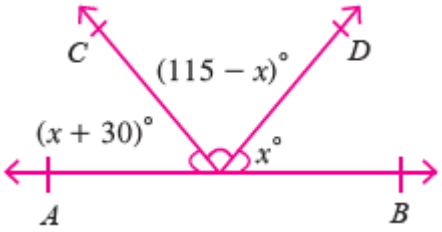
3. Question

Find the value of x in the following figures.

i.



ii.



Answer

i. In the given figure,

AB is a straight line, hence all the angles formed on it are supplementary.

⇒ (x – 20)° + x° + 40° = 180°

⇒ 2x + 20° = 180°

⇒ 2x = 180° - 20°

⇒ 2x = 160°

⇒ x = 80°

ii. In the given figure,

AB is a straight line, hence all the angles formed on it are supplementary.

$\Rightarrow (x + 30)^\circ + (115 - x)^\circ + x^\circ = 180^\circ$

$\Rightarrow x + 145^\circ = 180^\circ$

$\Rightarrow x = 180^\circ - 145^\circ$

$\Rightarrow x = 35^\circ$

4 A. Question

Find the angles in each of the following.

The angle which is two times its complement.

Answer

Let the complement of an angle be x°

According to the question,

Angle = $2x^\circ$

We know that two angles are said to be complementary if their sum is 90°.

So, $2x^\circ + x^\circ = 90^\circ$

$\Rightarrow 3x^\circ = 90^\circ$

$\Rightarrow x^\circ = 30^\circ$

$\therefore$ Angle = $2x^\circ = 2\times 30^\circ = 60^\circ$, Compliment = $x^\circ = 30^\circ$

4 B. Question

Find the angles in each of the following.

The angle which is four times its supplement.

Answer

Let the supplement of an angle be x°

According to the question,

Angle = $4x^\circ$

We know that two angles are said to be supplementary if their sum is 180°.

So, $4x^\circ + x^\circ = 180^\circ$

$\Rightarrow 5x^\circ = 180^\circ$

$\Rightarrow x^\circ = 36^\circ$

$\therefore$ Angle = $4x^\circ = 4\times 36^\circ = 144^\circ$, Compliment = $x^\circ = 36^\circ$

4 C. Question

Find the angles in each of the following.

The angles whose supplement is four times its complement.

Answer

Let the compliment of an angle be x°

According to the question,

Supplement of the angle = 4x°

We know that two angles are said to be supple mentary if their sum is 180°.

So, required angle = 180° - 4x° ..(I)

Also, if the two angles are complimentary their sum is 90°.

⇒ required angle = 90° - x° ...(II)

Equating I and II,

90° - x° = 180° - 4x°

⇒ 3x° = 90°

⇒ x° = 30°

Hence, required angle = 90° - x° = 90° - 30° = 60°

4 D. Question

Find the angles in each of the following.

The angle whose complement is one sixth of its supplement.

Answer

Let the supplement of an angle be x°

According to the question,

Compliment of the angle $= \frac{1}{6}x°$

We know that two angles are said to be supple-mentary if their sum is 180°.

So, $\text{required angle} = 180° - x°$ ..(I)

Also, if the two angles are complimentary their sum is 90°.

$\Rightarrow \text{required angle} = 90° - \frac{1}{6}x°$ ...(II)

Equating I and II,

$$180° - x° = 90° - \frac{1}{6}x°$$

$$\Rightarrow x° - \frac{1}{6}x° = 90°$$

$$\Rightarrow \frac{5}{6}x° = 90°$$

$\Rightarrow x° = 108°$

Hence, required angle = 180° - x° = 180° - 108° = 72°

4 E. Question

Find the angles in each of the following.

Supplementary angles are in the ratio 4:5.

Answer

Let the supplementary angles be 4x and 5x

We know that two angles are said to be supple mentary if their sum is 180°.

$\Rightarrow 4x + 5x = 180°$

$\Rightarrow 9x = 180°$

$\Rightarrow x = 20°$

So, the supplementary angles will be 4× 20° = 80° and 5× 20° = 100°

4 F. Question

Find the angles in each of the following.

Two complementary angles are in the ratio 3:2.

Answer

Let the complimentary angles be 3x and 2x

We know that two angles are said to be complimentary if their sum is 90°.

$\Rightarrow 2x + 3x = 90°$

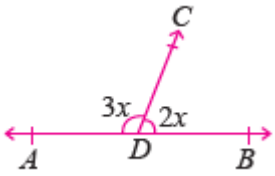
$\Rightarrow 5x = 90°$

$\Rightarrow x = 18°$

So, the complimentary angles will be 2×18° = 36° and 3×18° = 54°

5 A. Question

Find the values of x, y in the following figures.



Answer

Given: ∠ADC = 3x and ∠BDC = 2x

Here AB is the straight line.

∴ ∠ADC and ∠BDC are linear pair.

⇒ ∠ADC + ∠BDC = 180°

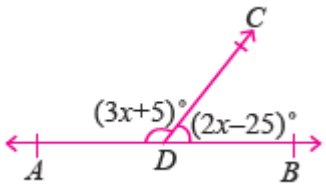
⇒ 3x + 2x = 180°

⇒ 5x = 180°

⇒ x = 36°

5 B. Question

Find the values of x, y in the following figures.



Answer

Given: ∠ADC = (3x + 5)° and ∠BDC = (2x – 25)°

Here AB is the straight line.

∴ ∠ADC and ∠BDC are linear pair.

⇒ ∠ADC + ∠BDC = 180°

⇒ 3x + 5 + 2x - 25 = 180°

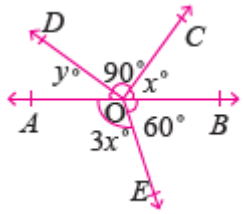
⇒ 5x - 20 = 180°

⇒ 5x = 200°

⇒ x = 40°

5 C. Question

Find the values of x, y in the following figures.



Answer

Given: ∠AOD = y° ,∠DOC = 90°,∠COB = x° ,∠AOE = 3x and ∠BOE = 60°

Here AB is the straight line.

∴ ∠AOE and ∠BDC are linear pair.

⇒ ∠ADC + ∠BOE = 180°

⇒ 3x + 60° = 180°

⇒ 3x = 120°

⇒ x = 40°

Also, ∠AOD, ∠DOC and ∠BOC are linear pair.

⇒ ∠AOD + ∠DOC + ∠BOC = 180°

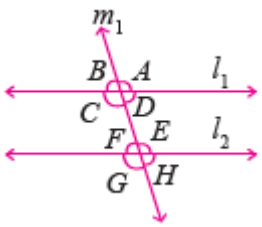
⇒ y + 90° + x° = 180°

⇒ y = 90° - 40°

⇒ y = 50°

6. Question

Let l_1 || l_2 and m_1 is a transversal. If ∠F = 65°, find the measure of each of the remaining angles.



Answer

Given: ∠F = 65°

∠B = ∠F = 65° {Corresponding angle}

∠H = ∠F = 65° {vertically opposite angle}

∠D = ∠B = 65° {vertically opposite angle}

Also, ∠C + ∠F = 180° {co-interior angles are supplementary}

⇒ ∠C = 180° - 65°

⇒ ∠C = 115°

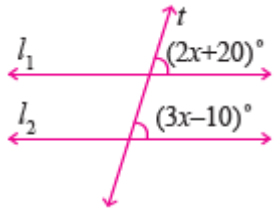
∠E = ∠C = 115° {Alternate interior angle}

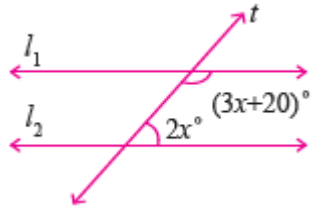
∠G = ∠C = 115° {Corresponding angle}

∠A = ∠G = 115° {Alternate exterior angle}

7. Question

For what value of x will l_1 and l_2 be parallel lines.

i. 

ii. 

Answer

(i) Given: $l_1 || l_2$

∠1 = (2x + 20)° and ∠2 = (3x-10)°

∵ Corresponding angles are equal

∴ ∠1 = ∠2

⇒ (2x + 20)° = (3x-10)°

⇒ x = 30°

ii. Given: $l_1 || l_2$

∠1 = (2x)° and ∠2 = (3x + 20)°

∵ Co-interior angles are supplementary

∴ ∠1 + ∠2 = 180°

⇒ (2x)° + (3x + 20)° = 180°

$\Rightarrow 5x = 160°$

$\Rightarrow x = 32°$

8. Question

The angles of a triangle are in the ratio of 1:2:3. Find the measure of each angle of the triangle.

Answer

Let the angles of a triangle be x, 2x and 3x.

We know that sum of the angles of a triangle is 180°.

$\Rightarrow x + 2x + 3x = 180°$

$\Rightarrow 6x = 180°$

$\Rightarrow x = 30°$

So, the angles of the triangle are 30°, 2×30° = 60° and 3× 30° = 90°.

9. Question

In ΔABC, $\angle A + \angle B = 70°$ and $\angle B + \angle C = 135°$. Find the measure of each angle of the triangle.

Answer

Given $\angle A + \angle B = 70°$ and $\angle B + \angle C = 135°$

We know that sum of the angles of a triangle is 180°.

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

Also, $\angle A + \angle B + \angle B + \angle C = 70° + 135°$

$\Rightarrow (\angle A + \angle B + \angle C) + \angle B = 205°$

From I,

$\Rightarrow 180° + \angle B = 205°$

$\Rightarrow \angle B = 205° - 180°$

$\Rightarrow \angle B = 25°$

Putting in given equations,

$\angle A + \angle B = 70°$ and $\angle B + \angle C = 135°$

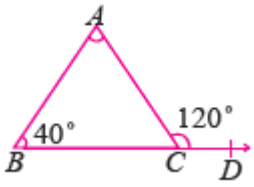
$\Rightarrow \angle A + 25° = 70°$ and $25° + \angle C = 135°$

$\Rightarrow \angle A = 45°$ and $\angle C = 110°$

So, the angles of the triangle are 45°, 25° and 110°.

10. Question

In the given figure at right, side BC of ΔABC is produced to D. Find ∠A and ∠C.



Answer

Given ∠B = 40° and ∠ACD = 120°

∵ ∠ACD is an external angle

∴ ∠ACD = ∠A + ∠B

⇒ ∠A + 40° = 120°

⇒ ∠A = 80°

We know that sum of the angles of a triangle is 180°.

∠A + ∠B + ∠C = 180°

⇒ 80° + + 40° + ∠C = 180°

⇒ ∠C = 180° - 120°

⇒ ∠C = 60°

Exercise 4.3

1. Question

If an angle is equal to one third of its supplement, its measure is equal to

A. 40°

B. 50°

C. 45°

D. 55°

Answer

Let the required angle be x and the supplement of x is y.

As we know if two angles are supplement of each other, then sum of those two angles is 180°.

$\Rightarrow x + y = 180$

$\Rightarrow y = 180 - x$

Now, according to question;

Required angle is equal to one third of its supplement;

i.e. $x = \frac{y}{3}$

$\Rightarrow y = 3x$

Now putting the value of y in this equation,

$\Rightarrow 180 - x = 3x$

$\Rightarrow 4x = 180$

$\Rightarrow x = \frac{180}{4}$

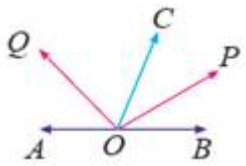
$\Rightarrow x = 45$

Hence, required angle is 45°.

Hence, correct option is (c).

2. Question

In the given figure, OP bisect ∠ BOC and OQ bisect ∠ AOC. Then ∠ POQ is equal to



A. 90°

B. 120°

C. 60°

D. 100°

Answer

Suppose that

∠ BOC = 2x and ∠ AOC = 2y

Now, by question; OP and OQ is the bisect or of ∠ BOC and ∠ AOC respectively.

$$\Rightarrow \angle BOP = \angle POC = \frac{\angle BOC}{2} = \frac{2x}{2} = x$$

Similarly,

$$\angle AOQ = \angle QOC = \frac{\angle AOC}{2} = \frac{2y}{2} = y$$

Now,

∠ POQ = ∠ POC + ∠ COQ = x + y

So, we have to find ∠ POQ i.e.x + y Now, ∠ BOC + ∠ AOC = 180

⇒ 2x + 2y = 180

⇒ 2(x + y) = 180

⇒ x + y = 180/2

⇒ x + y = 90°

Hence, ∠ POQ = 90°.

3. Question

The complement of an angle exceeds the angle by 60°. Then the angle is equal to

A. 25°

B. 30°

C. 15°

D. 35°

Answer

Let the required angle be x and it's complement is y.

So, $x + y = 90°$

⇒ y = 90 – x

Now, according to question;

Complement of the angle exceeds the angle by 60° i.e. y exceeds the x by 60°.

⇒ y – 60 = x

Now, putting the value of your in this equation,

⇒ (90 – x) – 60 = x

⇒ 30 – x = x

⇒ 2x = 30

⇒ x = 15°

Hence, required angle is 15°.

4. Question

Find the measure of an angle, if six times of its complement is 12° less than twice of its supplement.

A. 48°

B. 96°

C. 24°

D. 58°

Answer

Let the required angle be x and it's complement is y and it's supplement is z.

⇒ **x** + y = 90

i.e. y = 90 – x

And, x + z = 180

i.e. z = 180 – x

Now, according to question,

Six times of complement of x is 12°

less than twice of its supplement.

i.e. 6y = 2z – 12

Putting the value of y and z in this equation,

⇒ 6 (90 – x) = 2 (180 – x) – 12

⇒ 540 – 6x = 360 – 2x – 12

⇒ 6x – 2x = 540 – 360 + 12

⇒ 4x = 192

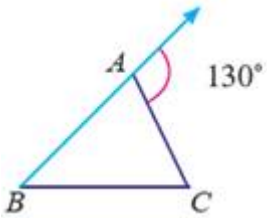
⇒ $\mathbf{x} = \frac{192}{4}$

⇒ x = 48°

Hence required angle is 48°.

5. Question

In the given figure, ∠ B:∠ C = 2:3, find ∠ B



A. 120°

B. 52°

C. 78°

D. 130°

Answer

Let ∠ B and ∠ C be 2x and 3x respectively.

Now, As we know sum of two interior angles of a triangle is equal to third exterior angle;

⇒ ∠ B + ∠ C = 130°

⇒ 2x + 3x = 130°

⇒ 5x = 130°

⇒ x = 26°

So, ∠ B = 2x = 2×26° = 52°

Hence, required angle is 52°.

6. Question

ABCD is a parallelogram, E is the mid – point of AB and CE bisects ∠ BCD. Then ∠ DEC is

A. 60°

B. 90°

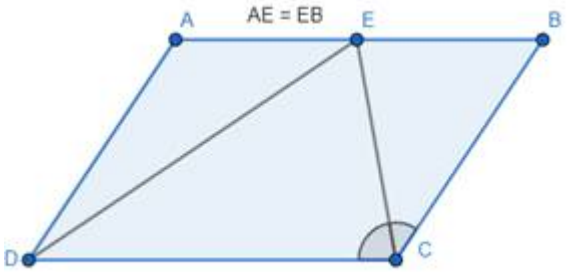
C. 100°

D. 120°

Answer

Given: ABCD is a parallelogram and E is the mid – point of AB such that CE bisects ∠ BCD.

construction: Join DE. The figure is given below:



Let ∠ BCD = 2x

⇒ ∠ BCE = ∠ ECD = ∠ BCD/2 = $\frac{2x}{2} = x$

Now, let ∠ ADC = 2y

And as we joined DE it will also bisect ∠ ADC.

Therefore, ∠ EDC = $\frac{2y}{2} = y$

Now, as we know sum of adjacent angles of parallelogram is equal to 180°.

⇒ ∠ BCD + ∠ ADC = 180°

⇒ 2x + 2y = 180°

⇒ 2 (x + y) = 180°

⇒ x + y = 90°

Now, In triangle CED,

∠ CED + ∠ EDC + ∠ DCE = 180°

⇒ ∠ CED + x + y = 180°

⇒ ∠ CED + 90° = 180°

⇒ ∠ CED = 180° – 90°

⇒ ∠ CED = 90°

Hence required angle is 90°.