Chapter : 16. PARALLELOGRAMS

Exercise : 16A

Question: 1

ABCD is a paralle

Solution:

Since the sum of any two adjacent angles of a parallelogram is 180°,

∠A + ∠B = 180°

110° + ∠B = 180°

∠B = (180° - 110°) = 70°

Also, ∠B + ∠C = 180° [Since, ∠B and ∠C are adjacent angles]

70° + ∠C = 180°

∠C = (180° - 70°) = 110°.

Further, ∠C + ∠D = 180° [Since, ∠C and ∠D are adjacent angles]

110° + ∠D = 180°

∠D = (180° - 110°) = 70°.

Therefore, ∠B = 70°, ∠C = 110° and ∠D = 70°.

Question: 2

Two adjacent angl

Solution:

Let ∠A, ∠B are the two adjacent angles.

According to question,

∠A = ∠B

As we know that, sum of any two adjacent angles of a parallelogram is 180°

∠A + ∠B = 180°

∠A + ∠A = 180°

2∠A = 180°

∠A = 90°

Question: 3

Two adjacent angl

Solution:

Let x be the common multiple.

Since the sum of any two adjacent angles of a parallelogram is 180°,

∠A + ∠B = 180°

4x + 5x = 180°

9x = 180°

x = 20°

∠A = 80°

∠B = 100°

Also, ∠B + ∠C = 180° [Since, ∠B and ∠C are adjacent angles]

100° + ∠C = 180°

∠C = (180° - 100°) = 80°

Further, ∠C + ∠D = 180° [Since, ∠C and ∠D are adjacent angles]

80° + ∠D = 180°

∠D = (180° - 80°) = 100°

Therefore, ∠A = 80°, ∠B = 100°, ∠C = 80° and ∠D = 100°.

Question: 4

Two adjacent angl

Solution:

Let ∠A = (3x - 4)°, ∠B = (3x + 16)°

Since the sum of any two adjacent angles of a parallelogram is 180°,

∠A + ∠B = 180°

(3x - 4)° + (3x + 16)° = 180°

6x + 12° = 180°

6x = 180° - 12°

6x= 168°

X= 168/6 = 28°

∠A = (3x - 4)° = 80°

∠B = (3x + 16)° = 100°

Also, ∠B + ∠C = 180° [Since, ∠B and ∠C are adjacent angles]

100° + ∠C = 180°

∠C = (180° - 100°) = 80°

Further, ∠C + ∠D = 180° [Since, ∠C and ∠D are adjacent angles]

80° + ∠D = 180°

∠D = (180° - 80°) = 100°

Therefore, x= 28°, ∠A = 80°, ∠B = 100°, ∠C = 80° and ∠D = 100°.

Question: 5

The sum of two op

Solution:

Let ABCD is a parallelogram.

∠ B + ∠ D = 130°

∠B + ∠B = 130° (Opposite angles of parallelogram are equal)

∠B = 65°

∠D = 65°

Now, ∠B + ∠C = 180° (sum of any two adjacent angles of a parallelogram is 180°)

∠C = 180° - ∠B = 115°

Now, ∠A = ∠C = 115° (Opposite angles of parallelogram are equal)

Therefore, ∠A = 115°, ∠B = 65°, ∠C = 115° and ∠D = 65°.

Question: 6

Two sides of a pa

Solution:

Let x be the common multiple.

According to question, sides will be 5x and 3x.

Perimeter = $2(l+w)$

64 = 2 (5x + 3x)

64 = 16x

x = 4

5x = 20 cm

3x = 12 cm

So, sides will be 20 cm and 12 cm.

Question: 7

The perimeter of

Solution:

Let x be the common multiple.

According to question, sides will be x and (x + 10).

Perimeter = $2(l+w)$

140 = 2 (x + (x + 10))

140 = 2 (2x + 10)

140 = 4x + 20

4x = 120

X =30 cm

X + 10 = 40 cm

So, sides will be 30 cm and 40 cm.

Question: 8

In the adjacent f

Solution:

In a triangles BMC and DNABC = DA (Opposite sides) ∠BCM = ∠DAN (alternate angles)∠DNA = ∠BMC = 90° [DN and BM are perpendicular to AC]So by AAS Congruency criterionΔBMC ≅ ΔDNA BM = DN (By CPCT)

Question: 9

In the adjacent f

Solution:

According to question,

$\angle A = \angle C$ (Opposite angles)

Line segments AE and CF bisect the $\angle A$ and $\angle C$ means,

$\sqrt{100} = \frac{1}{2}\angle C$

∠DAE = ∠BCF ----------(i)

Now, In triangles ADE and CBF,

AD = BC (Opposite sides)

∠B = ∠D (Opposite angles)

∠DAE = ∠BCF (from (i))

Therefore, Δ ADE ≅ ΔCBF (By ASA congruency)

By CPCT, DE=BF

But, CD=AB

CD - DE = AB - BF.

So, CE = AF.

Therefore, AECF is a quadrilateral having pairs of side parallel and equal,

So, AECF is a parallelogram. Hence, AE || CF.

Question: 10

The lengths of th

Solution:

Let ABCD be a rhombus with diagonals AC and BD.

AC and BD bisect at O.

So, AO = $\frac{16}{2}$ = 8 cm

And BO = $\frac{12}{2}$ = 6 cm

In right angled triangle AOB,

$AB^2 = AO^2 + OB^2$ (According to Pythagoras theorem)

$AB^2 = 8^2 + 6^2$

$AB^2 = 64 + 36$

AB = $\sqrt{100}$

= 10 cm.

So, Length of Rhombus of each side is 10 cm.

Question: 11

In the given figu

Solution:

Let $\angle CAD$ be x.

ABCD is a square.

So, DA = DC (every side of square is equal)

Therefore,

∠ACD = ∠CAD = x°

∠ACD + ∠CAD + ∠ADC= 180° (ACD is right angled triangle)

x° + x° + 90° = 180°

2 x° = 90°

x° = 45°

Question: 12

The sides of a re

Solution:

Let x be the common multiple.

Length = 5x

Breadth = 4x

Perimeter = $2(l+w)$

90 = 2 (5x + 4x)

18x = 90

X = 5

Length = 5x = 25 cm

Breadth = 4x = 20 cm

Question: 13

Name each of the

Solution:

(i) rectangle

(ii) square

(iii) rhombus

(iv) rhombus

(v) square

(vi) rectangle

Question: 14

Which of the foll

Solution:

(i) False

Diagonals of parallelogram bisects each other.

(ii) False

Diagonals of rectangle do not intersect at right angle. So, they are not perpendicular to each other.

(iii) False

Diagonals of rhombus bisect each other. If it’s all sides are equal then only diagonals will be equal and it will be a square.

(iv) False

All kites are rhombus but every rhombus is not a kite.

(v) False

In square all sides are equal. Length of sides may vary in case of rectangle.

(vi) True

In Parallelogram, opposite sides and opposite angles are equal. In square all sides are equal and all angles are right angles.

(vii) True

All sides are equal and diagonals bisect each other.

(viii) True

Opposite sides and opposite angles are equal.

(ix) False

Rectangle forms right angle between adjacent sides but it is not necessary for every parallelogram.

(x) True

Opposite sides and opposite angles are equal.

Exercise : 16B

Question: 1

The two diagonals

Solution:

All sides of Rhombus are equal in length but in case of angle it is not necessary to be equal.

If all the angles are equal then it will become a square. That's why diagonals of rhombus are not necessary to be equal in length.

Question: 2

The lengths of th

Solution:

Let ABCD be a rhombus with diagonals AC and BD.

AC and BD bisect at O.

So, AO = $\frac{16}{2}$ = 8 cm

And BO = $\frac{12}{2}$ = 6 cm

In right angled triangle AOB,

$AB^2 = AO^2 + OB^2$ (According to Pythagoras theorem)

$AB^2 = 8^2 + 6^2$

$AB^2 = 64 + 36$

AB = $\sqrt{100}$

= 10 cm.

So, Length of Rhombus of each side is 10 cm.

Question: 3

Two adjacent angl

Solution:

Let ∠A = (2x + 25)°, ∠B = (3x - 5)°

Since the sum of any two adjacent angles of a parallelogram is 180°,

∠A + ∠B = 180°

(2x + 25)° + (3x - 5)° = 180°

5x + 20° = 180°

5x = 180° - 20°

5x= 160°

X= 160/5 = 32°

So, Value of x is 32°.

Question: 4

The diagonals do

Solution:

The diagonals do not necessarily intersect at right angles in a parallelogram. Only opposite sides, opposite angles are equal and diagonal bisects each other in parallelogram. If diagonals intersect each other at right angle then it would be square or rhombus.

Question: 5

The length and br

Solution:

Let x be the common multiple.

Length = 4x

Breadth = 3x

According to Pythagoras theorem,

$(4x)^2 + (3x)^2 = (25)^2$

$16x^2 + 9x^2 = 625$

$25x^2 = 625$

$x^2 = \frac{625}{25}$

X =5

So,

Length = 4x = 20 cm

Breadth = 3x = 15 cm

Perimeter = $2(l + w)$

= 2 (20 + 15)

= 70 cm

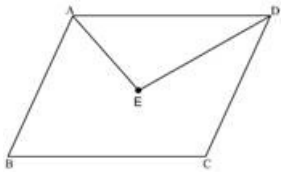
So, perimeter of rectangle is 70 cm.

Question: 6

The bisectors of

Solution:

Let ABCD is a parallelogram.



AE and AD is the bisector angles of adjacent angles of ∠A and ∠D.

As we know that,

$\angle A + \angle D = 180^o$ (Sum of interior angles on the same side of traversal is 180^o)

$\frac{1}{2}\angle A + \frac{1}{2}\angle D = \frac{1}{2}\times 180^\circ$

$= 90^o$ ----------(i)

Now, in triangle AOD,

$\angle AED + \frac{1}{2}\angle A + \frac{1}{2}\angle D = 180^o$ (AE and AD is the angle bisector of $\angle A$ and $\angle D$.)

$\angle AED + 90^o = 180^o$ (From eq (i))

$\angle AED = 180^o - 90^o = 90^o$

So, the bisectors of any two adjacent angles of a parallelogram intersect at 90^o

Question: 7

If an angle of a

Solution:

Let $\angle A = x°$, $\angle B = \frac{2x^\circ}{3}$

Since the sum of any two adjacent angles of a parallelogram is 180°,

$\angle A + \angle B = 180°$

$x° + \frac{2x^\circ}{3} = 180°$

$\frac{5x^\circ}{3} = 180°$

$5x^\circ = 540°$

$x° = 108°$

$\angle A = 108°$

$\angle B = 72°$

Also, $\angle B + \angle C = 180°$ [Since, $\angle B$ and $\angle C$ are adjacent angles]

$72° + \angle C = 180°$

$\angle C = (180° - 72°) = 108°$

Further, $\angle C + \angle D = 180°$ [Since, $\angle C$ and $\angle D$ are adjacent angles]

$108° + \angle D = 180°$

$\angle D = (180° - 108°) = 72°$

Therefore, smallest angle of the parallelogram is 72°.

Question: 8

The diagonals do

Solution:

In rectangle, only opposite sides are equal which makes diagonals are not to be perpendicular to each other. As diagonals are not perpendicular to each other, they will not bisect the interior angles.

Question: 9

In a square ABCD,

Solution:

In square all sides are equal.

So, AB = BC

2x + 3 = 3x -5

3x -2x = 5 + 3

X = 8.

Question: 10

If one angle of a

Solution:

Let ∠A = x°,

∠B = (2x – 24)°

∠C = x° (Opposite angles are equal.)

∠D = (2x – 24)° (Opposite angles are equal.)

Since the sum of angles of a parallelogram is 360°,

∠A + ∠B + ∠C + ∠D = 360°

x° + (2x – 24)° + x° + (2x – 24)° = 360°

6x° – 48 =360°

6x° = 408°

x° = 68°

∠A = 68°

∠B = (2x – 24)° = 112°

Therefore, largest angle of the parallelogram is 112°.