14. Quadrilaterals

Exercise 14.1

1. Question

Three angles of a quadrilateral are respectively equal to 110°, 50° and 40°. Find its fourth angles.

Answer

Given,

Three angles of quadrilateral = 110°, 50°, 40°

Let fourth angle be = X°

As we know sum of all angles of a quadrilateral =360°

So,

110°+50°+40°+X° = 360°

X°= 360° - 200°=160°

2. Question

In a quadrilateral ABCD, the angles A, B, C and D are in the ratio 1 : 2 : 4 : 5. Find the measure of each angles of the quadrilateral.

Answer

Given,

In quadrilateral ABCD,

A:B:C:D = 1:2:3:4:5

Let angles A, B, C, D = x, 2x, 4x, 5x

So,

x+2x+4x+5x = 360°

12x = 360°

$x = \frac{360°}{12} = 30°$

So,

$\angle A = x = 30°$

$\angle B = 2x = 2\times30° = 60°$

$\angle C = 4x = 4\times30° = 120°$

$\angle D = 5x = 5\times30° = 150°$

3. Question

In a quadrilateral ABCD, CO and DO are the bisectors of ∠C and ∠D respectively. Prove that ∠COD = $\frac{1}{2}$ (∠A+∠B).

Answer

Given,

In quadrilateral ABCD,

CO is the bisector of ∠C

DO is the bisector of ∠D

In ΔCOD

$\frac{1}{2}\angle C + \frac{1}{2}\angle D + \angle COD = 180°$

⇒ ∠COD = $180° - \frac{1}{2}(\angle D + \angle C)$

⇒ ∠D+∠C = 360 – (∠A+∠B)

SO,

⇒ ∠COD =$180 - \frac{1}{2}\left(360 - (\angle A + \angle B)\right)$

⇒ ∠COD = $\frac{1}{2}$(∠A+∠B) Proved.

4. Question

The angles of a quadrilateral are in the ratio 3 : 5 : 9 : 13. Find all the angles of the quadrilateral.

Answer

Given,

Ratio of angles of quadrilateral = 3:5:9:13

Let angles are = 3x, 5x, 9x, 13x

So,

3x+5x+9x+13x = 360°

30x = 360°

$x = \frac{360°}{30} = 12°$

Angles would be =

3x = 3×12 = 36

5x = 5×12 = 60°

9x = 9×12 = 108°

13x = 13×12 = 156°

Exercise 14.2

1. Question

Two opposite angles of a parallelogram are (3x-2)° and (50-x)°. Find the measure of each angle of the parallelogram.

Answer

Given,

Two opposite angles of a parallelogram (3x - 2) and (50 – x)

Opposite angles of a parallelogram are equal,

3x – 2 = 50 – x

4x = 52°

X = 13°

So, angles are

3x – 2 = 3×13-2 = 37°

50 – x = 50 -13 = 37°

Sum of other two angles = 360 - 2×37 = 360 – 74 = 286°

So each angle will be $= \frac{286}{2} = 143^{\circ}$

2. Question

If an angle of a parallelogram is two-third of its adjacent angle, find the angles of the parallelogram.

Answer

Given,

In a parallelogram

$\text{one angle} = \frac{2}{3}\ \text{adjacent angle}$

Let angle = x

So $\text{adjacent angle} = \frac{2}{3}x$

We know that opposite angles of parallelogram are equal

So, four angles will be $= x, x, \frac{2}{3}x, \frac{2}{3}x$

And $x + x + \frac{2}{3}x + \frac{2}{3}x = 360^{\circ}$

$\frac{10}{3}x = 360^{\circ} = 10x = 360^{\circ}\times 3$

$x = \frac{360\times 3}{10} = 108^{\circ}$

So, x = 108°

Adjacent angles will be $= \frac{2}{3}x = \frac{2}{3}\times 108 = 72^{\circ}$

Angles are = 108°, 108°, 72° and 72°

3. Question

Find the measure of all the angles of a parallelogram, if one angle is 24° less than twice the smallest angle.

Answer

Given,

Let the smallest angle = x°

Than the other angle = (2x – 24)°

So,

x°+x°+2x – 24 + 2x – 24 = 360°

6x = 360 + 48 = 408

$x = \frac{408^{\circ}}{6} = 68^{\circ}$

Other angles = 2x – 24 = 2×68 – 24 = 136-24 = 112°

Angles are = 68°, 68°, 112°, 112°

4. Question

The perimeter of a parallelogram is 22 cm. If the longer side measures 6.5 cm. what is the measure of the shorter side?

Answer

Given,

Peremeter of parallelogram = 22cm

Longer side = 6.5cm

Let shorter side be = x cm

So,

2(6.5 + x) = 22cm

13.0 + 2x = 22cm

2x = 22 – 13 = 9cm

$x = \frac{9}{2} = 4.5\text{cm}$

5. Question

In a parallelpgram ABCD, ∠D=135°, determine the measures of ∠A and ∠B.

Answer

Given,

In a parallelogram ABCD

∠D= 135°

∠C + ∠D = 180°.. (supplementary angles)

∠C = 180° - 135° = 45°

∠C = ∠A and ∠D = ∠B.. (Opposite angles of parallelogram)

∠A = 45°

∠B = 135°

6. Question

ABCD is a parallelogram in which ∠A=70°. Compute ∠B, ∠C and ∠D.

Answer

Given,

In a parallelogram ABCD,

∠A =70°

∠A + ∠B = 180°.. (supplementary angles)

∠B = 180° – 70° = 110°

∠A = ∠C and ∠B = ∠D.. (Opposite angles of parallelogram)

∠A = 70, ∠B = 110, ∠C = 70, ∠D = 110°

7. Question

In Fig. 14.34, ABCD is a parallelogram in which ∠A=60°. If the bisectors of ∠A and ∠B meet at P, prove that AD=DP, PC=BC and DC=2AD.

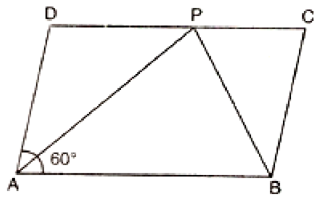


Fig. 14.34

Answer

Given,

In a parallelogram ABCD,

∠A = 60°

So,

∠B = 180 – 60 = 120 (supplementary angles)

∠ABP = ∠PCB = $\frac{120}{2} = 60^{\circ}$

∠DPA = ∠BAP = 30° (AB parallel to DC and AP intersects them)

∠DPA = ∠DAP = 30°

AD = DP... (i) (proved)

Similarly,

∠BPC = ∠ABP = 60°

In triangle BPC , ∠BPC = ∠PBC = 60°

BC = CP = AD... (ii) (proved)

BC = AD

From equation (i) and (ii),

CP = DP

DC = 2AD (proved)

8. Question

In Fig. 14.35, ABCD is a parallelogram in which ∠DAB =75° and ∠DBC = 60°. Compute ∠CDB and ∠ADB.

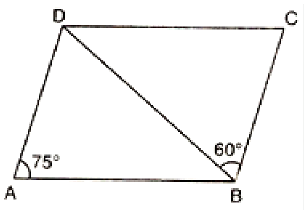


Fig. 14.35

Answer

Given,

In a parallelogram ABCD,

∠DAB = 75°

∠DBC = 60°

∠A + ∠B = 180° (supplementary angles)

∠B = 180° – 75° = 105°

∠DBA +∠DBC = 105°

∠DBA = 105° – 60° = 45°

In a triangle ABD

∠DAB + ∠DBA + ∠ADB = 180°

75° + 45° + ∠ADB = 180°

∠ADB = 180° -120° = 60°

∠A = ∠C = 75° (opposite angles of parallelogram)

∠C + ∠D = 180° (supplementary angles of parallelogram)

∠D = 180° – 75° = 105°

∠ADB + ∠CDB = 105°

∠CDB = 105° - ∠ADB

∠CDB = 105° – 60° = 45°

9. Question

In Fig. 14.36, ABCD is a parallelogram and E is the mid-point of side BC. If DE and AB when produced meet at F, prove that AF=2AB.

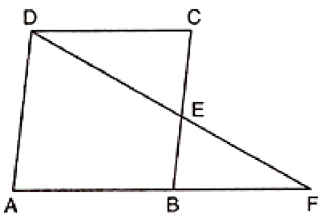


Fig. 14.36

Answer

Given,

In a parallelgram ABCD,

E = mid point of side BC

AD □□BC

AD □□BE

E is mid point of BC

So, in ΔDEC and ΔBEF

BE = EC.. (E is the mid point)

∠DEC = ∠BEF

∠DCB = ∠FBE (vertically opposite angles)

So, ΔDEC ≅ ΔBEF

DC = FB

=AB+DC = FB+AB

=2AB =AF (proved)

10. Question

Which of the following statements are true (T) and which are false (F)?

(i) In a parallelogram, the diagonals are equal.

(ii) In a parallelogram, the diagonals bisect each other.

(iii) In a parallelogram, the diagonals intersect each other at right angles.

(iv) In any quadrilateral, if a pair of opposite sides is equal, it is a parallelogram.

(v) If all the angles of a quadrilateral are equal, it is a parallelogram.

(vi) If three sides of a quadrilateral are equal, it is a parallelogram.

(vii) If three angles of a quadrilateral are equal, it is a parallelogram.

(viii)If all the sides of a quadrilateral are equal it is a parallelogram.

Answer

(i) False

Reason: Imagine a parallelogram and draw its diagonals. Now the areas of the two triangles on one of the bases is equal. But by Heron's formula, the areas are not equal and if the areas are not equal how can be the diagonals because area can only be equal if both the triangles have equal diagonals.

(ii) True

Proof:

Let's take a parallelogram ABCD,

The diagonals AC and BD intersect each other at O,

AO = OC and BO = OD

In ΔAOB and ΔCOD,

We have

∠BAO = ∠OCD (alternate interior angles)

∠AOB = ∠CDO (alternate interior angles)

AB = DC (opposite sides)

ΔAOB≅ΔCOD (by ASA)

AO = OC and DO = OB

(iii) False

According to the definition a parallelogram is a simple (non-self-intersecting) quadrilateral with two pairs of parallel sides. The opposite or facing sides of aparallelogram are of equal length and the opposite angles of a parallelogram are of equal measure.

It turns out that a parallelogram has its diagonalsmeeting at right angles if and only if the parallelogram is a rhombus (all sides equal).

(iv) True

Reason: Let's take ABCD is a quadrilateral,

Where AB = CD & AD = BC

We have to prove : ABCD is a parallelogram

Join AC, it's a diagonal

In ΔABC and ΔCDA

AB = CD

BC = DA

AC = CA

ΔABC≅ΔCDA

Hence,

∠BAC = ∠DCA

For lines AB and CD with transversal AC,

∠BAC & ∠DCA are alternate angles and are equal.

So, AB and CD lines are parallel.

∠BCA = ∠DAC

For lines AD and BC with transversal AC,

∠BCA & ∠DAC are alternate angles and are equal.

So, AD and BC lines are parallel.

Thus in ABCD,

Both pairs of opposite sides are parallel,

So, ABCD is a parallelgram.

(v) False

Reason: If all the angles of a quadrilateral are equal, then it's a rectangle.

(vi) False

Reason:

As we know that the opposite or facing sides of aparallelogram are of equal length and the opposite angles of a parallelogram are of equal measure.

In case of square and rhombus all side are equal, but if three sides are equal then it doesn't satisfied the property of parallelogram.

(vii) False

Reason:

Same reason as for the sides, it does not satisfied the property of a parallelogram.

(viii) True

Yes if all side of a parallelogram than it's a square or rhombus.

Exercise 14.3

1. Question

In a parallogram ABCD, determine the sum of angles ∠C and ∠D.

Answer

Given,

In a parallelogram ABCD,

∠C and ∠D are supplementary angles of parallelogram

So, ∠C + ∠D = 180°

2. Question

In a parallelogram ABCD, if ∠B=135°, determine the measures of its other angles.

Answer

Given,

∠B = 135°

∠A + ∠B = 180° (supplementary angles of parallelogram)

∠A = 180° – 135° = 45°

∠C = ∠A = 45° (opposite angles of parallelogram)

∠D = ∠B = 135°

3. Question

ABCD is a square. AC and BD intersect at O. State the measure of ∠AOB.

Answer

Given,

ABCD is a square

AC and BD intersects at O

∠AOB = 90° (diagonals of square bisects each other at 90°)

4. Question

ABCD is a rectangle with ∠ABD=40°. Determine ∠DBC.

Answer

Given,

ABCD is a rectangle

∠ABD = 40°

∠ABD + ∠DBC = 90° (angles of rectangle)

∠DBC = 90° – 40° = 50°

5. Question

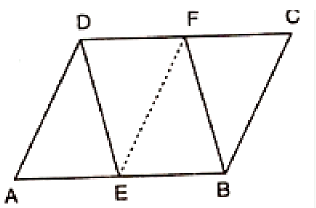
The sides AB and CD of a parallelogram ABCD are bisected at E and F. Prove that EBFD is a parallelogram.

Answer

Given,

In a parallelogram ABCD

AB & CD bisect at E & F



AB □□CD

AB = DC

EB □□DF

So, EB = DF

$$= \frac{1}{2}\mathrm{AB} = \frac{1}{2}\mathrm{DC}$$

So, EBFD is a parallelogram.

6. Question

P and Q are the points of trisection of the diagonal BD of a parallelogram ABCD. Prove that CQ is parallel to AP. Proves also that AC bisects PQ.

Answer

Given,

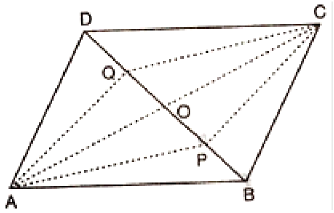
In a parallelogram ABCD

Since diagonal of parallelogram bisects each other

OA = OC and OB = OD

Since P&Q are the point of trisection of BD

BP = PQ = QD



Now, OB = OD and BP = QD

OB-BP = OD-QD

OP = OQ

Diagonals of quadrilateral bisect each other

Hence, APCQ is a parallelogram.

7. Question

ABCD is a square E, F, G and H are points on AB, BC, CD and DA respectively, such that AE=BF=CG=DH. Prove that EFGH is a square.

Answer

Given,

ABCD is a square

E,F,G,H are the points of AB, BC, CD, DA

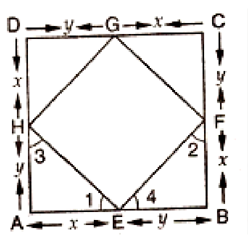
Such that AE = BF = CG = DH

In ΔAEH & ΔBFE

Let,

AE = BF = CG = DH = x

BE = CF = DG = AF = y



In ΔAEH & ΔBFE

AE = BF (given)

∠A = ∠B (each equal)

AH = BE

So, by SAS congruency

$\Delta AEH \cong \Delta BFE$

$\angle 1 = \angle 2$ & $\angle 3 = \angle 4$

$\angle 1 + \angle 3 = 90^\circ$

$\angle 2 + \angle 4 = 90^\circ$

$\angle 1+\angle 2+\angle 3+\angle 4 = 180^\circ$

$\angle 1+\angle 4+\angle 1+\angle 4 = 180^\circ$

$2(\angle 1+\angle 4) = 180^\circ$

$\angle 1+\angle 4 = \frac{180}{2} = 90^\circ$

So, $\angle HEF = 90^\circ$

Similarly we have,

$\angle F = \angle G = \angle H = 90^\circ$

Hence, EFGH is a square.

8. Question

ABCD is a rhombus, EABF is a straight line such that EA=AB=BF. Prove that ED and FC when produced meet at right angles.

Answer

Given,

ABCD is a rhombus,

EABF is a straight line

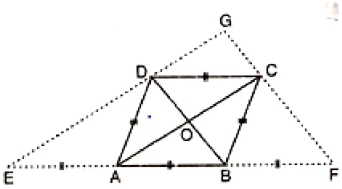
EA = AB = BF

OA = OC

OB = OD (diagonals of rhombus are perpendicular bisector of each other)

$\angle AOD = \angle COD = 90^\circ$

$\angle AOB = \angle COB = 90^\circ$



In ΔBDE,

A and O are mid points of BE and BD

OA □□DE

OC □□DG

In ΔCFA

B and O are the mid points of AF and AC

OB □□CF and

OD □□GC

Thus in quadrilateral DOCG

OC □□DG and

OD □□GC

DOCG is a parallelogram

∠DGC = ∠DOC

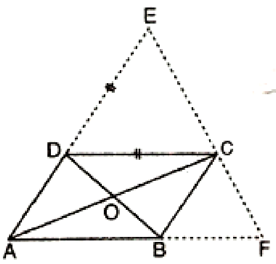
∠DGC = 90 (proved)

9. Question

ABCD is a parallelogram, AD is produced to E so that DE=DC and EC produced meets AB produced in F. Prove that BF=BC.

Answer

Given: ABCD is a parallelogram,

Diagram: 

To Prove: BF = BC **Proof:**

In ΔACE

D and O are the mid points of AE and AC

DO □□EC

OB □□CF and AB = BF → (i)

DC = BF (AB = DC as ABCD is a parallelogram and opposite sides of a parallelogram are equal and parallelP))

In ΔEDC and ΔCBF

DC = BC

∠EDC = ∠CBF

∠ECD = ∠CFB

So, by ASA congruency

ΔEDC≅ΔCBF

DE = BC

DC = BC

AB = BC

BF = BC (AB = BF from (i))

Exercise 14.4

1. Question

In a ΔABC, D, E and F are, respectively, the mid points of BC, CA and AB. If the lengths of side AB, BC and CA are 7 cm, 8 cm and 9 cm, respectively, find the perimeter of ΔDEF.

Answer

Given,

In ΔABC

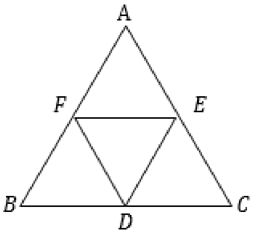
D, E, F are the mid points of BC, CA and AB

AB = 7cm

BC = 8cm

CA = 9cm

We need to find out the perimeter of DEF



So,

$$DE = \frac{1}{2}BC = \frac{1}{2}\times 8 = 4cm$$

$$EF = \frac{1}{2}AB = \frac{1}{2}\times 7 = 3.\,cm$$

$$DF = \frac{1}{2}AC = \frac{1}{2}\times 9 = 4.5cm$$

So, perimeter of DEF

DE+EF+DF = 4+3.5+4.5 = 12cm

2. Question

In a triangle ∠ABC, ∠A =50°, ∠B =60° and ∠C = 70°. Find the measure of the angles of the triangle formed by joining the mid-points of the sides of this triangle.

Answer

Given,

In a ΔABC

∠A =50°

∠B =60°

∠C = 70°

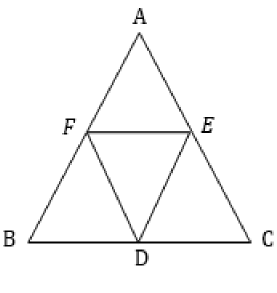
Let DEF are mid point of ΔABC

BDEF and CDFE are parallelogram

∠B = ∠E & ∠C = ∠F

∠E = 60°

∠F = 70°



Similarly

∠D = ∠A

∠D = 50°

3. Question

In a triangle, P, Q and R are the mid-points of sides BC, CA and AB respectively. If AC = 21 cm, BC = 29 cm and AB= 30 cm, find the perimeter of the quadrilateral ARPQ.

Answer

Given,

In ΔABC

P, Q and R are the mid-points of sides BC, CA and AB

AC = 21cm

BC = 29cm

AB = 30cm

Since ARPQ is a parallelogram

Peremeter of parallelogram ARPQ = 2(AP+AQ)

AB+AC = 30+21 = 51cm

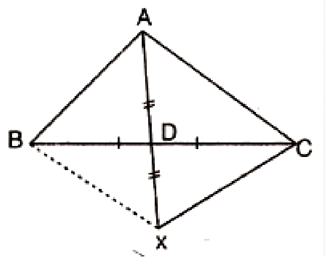
4. Question

In a ΔABC, median AD is produced to X such that AD=DX. Prove that ABXC is a parallelogram.

Answer

Given,

In ΔABC,



AD is produced to X

AD=DX

In quadrilateral ABXC

AD=DX (Given)

BD = DC (given)

So diagonal AX and BC bisect eachother

Therefore ABXC is a parallelogram.

5. Question

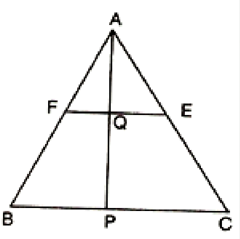
In a ΔABC, E and F are the mid-points of AC and AB respectively. The altitude AP to BC intersects EF at Q. Prove that AQ=QP.

Answer

Given,

In ΔABC,

E & F are the mid-points of AC and AB



EF ∥BC

SO, FQ ∥BP

Q is the mid point of AP

AQ = QP (Proved)

6. Question

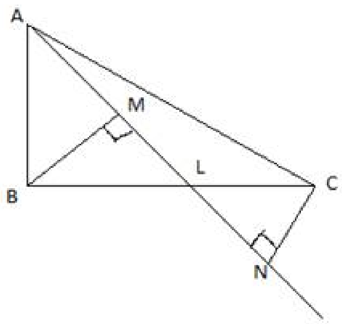
In a ΔABC, BM and CN are perpendiculars from B and C respectively on any line passing through A. If L is the mid-point of BC, prove that ML=NL.

Answer

Given,

In ΔABC,

BM & CN are perpendiculars from B &C



In ΔBLM and ΔCLN

∠BML =∠CNL= 90°

BL=CL [L is mid point of BC]

∠MLB=∠NLC [vertically opposite angles]

∴ ΔBLM=ΔCLN

∴ LM = LN (corresponding sides of congruent triangles)

7. Question

In Fig. 14.95, triangle ABC is right-angled at B. Given that AB=9 cm, AC=15 cm and D, E are the mid-points of the sides AB and AC respectively, calculate

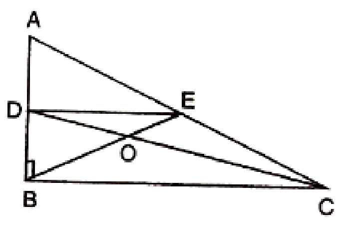


Fig. 14.95

(i) The length of BC

(ii) The area of ΔADE.

Answer

Given,

ΔABC is right angled at B

AB = 9cm

AC = 15cm

D, E are mid points of side AB and AC

(i) by using pythagores theorem

BC = $\sqrt{AC^2 - AB^2}$

BC = $\sqrt{15^2 - 9^2}$

$= \sqrt{144} = 12cm$

(ii) Area of ΔADE

$= \frac{1}{2} \times DE \times AD = \frac{1}{2}\left\{\left(\frac{1}{2}BC \times \frac{1}{2}AB\right)\right\}$

$= \frac{1}{2}(6 \times 4.5) = 13.5cm^2$

8. Question

In Fig. 14.96, M, N and P are mid points of AB, AC and BC respectively. If MN=3 cm, NP=3.5 cm and MP = 2.5 cm, calculate BC, AB and AC.

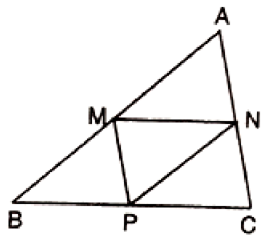


Fig. 14.96

Answer

Given,

M, N, P are mid points AB, AC and BC

MN = 3cm

NP = 3.5cm

MP = 2.5cm

MN = $\frac{1}{2}BC$

BC = 2MN = 2×3 = 6cm

MP = $\frac{1}{2}AC$

AC = 2MP = 2×2.5 = 5cm

AP = $\frac{1}{2}AB$

AB = 2AP = 2×3.5cm

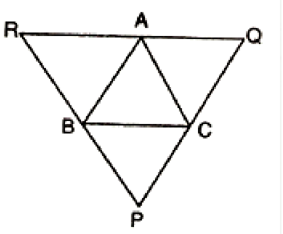
9. Question

ABC is a triangle and through A, B, C lines are drawn parallel to BC, CA and AB respectively intersecting at P, Q and R. Prove that the perimeter of ΔPQR is double the perimeter of ΔABC.

Answer

Given,

In ΔABC



ABCQ and ARBC are parallelograms,

BC = AQ &

BC = AR

AQ = AR (A is mid point of QR)

Similarly B and C are the mid point of PR and PQ

AB = $\frac{1}{2}$PQ

BC = $\frac{1}{2}$QR

AC = $\frac{1}{2}$PR

PQ = 2AB

QR = 2BC

PR = 2CA

PQ+QR+RP = 2(AB+BC+CA)

Perimeter of PQR = 2(Perimetre of ΔABC)

10. Question

In Fig. 14.97, BE⊥AC. AD is any line from A to BC intersecting BE in H, P, Q and R are respectively the mid points of AH, AB and BC. Prove that ∠PQR = 90°

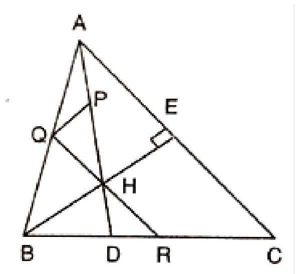


Fig. 14.97

Answer

Given,

In ΔABC,

Q, R are the mid points of AB and AC

QR || AC.. (i)

In ΔABH,

Q, P are the mid points of AB and AH respectively,

QP || BH

QP || BE.. (ii)

But AC^BE therefore from (i) and (ii)

QP^QR

∠PQR = 90°

11. Question

In Fig. 14.98, AB=AC and CP||BA and AP is the bisector of exterior ∠CAD of ΔABC. Prove that (i) ∠PAC=∠BCA (ii) ABCP is a parallelogram.

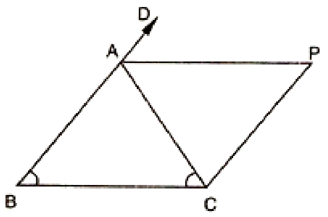


Fig. 14.98

Answer

Given,

In figure 14.98

AB = AC

CP || BA

AP is bisector of exterior angle ∠CAD

AB = AC

∠C = ∠B

NOW,

∠CAD = ∠B +∠C

2∠CAP = 2∠C

∠CAP = ∠C

AP || BC

But, AB || CP (given)

Hence ABCP is a parallelogram

12. Question

ABCD is a kite having AB=AD and BC=CD. Prove that the figure formed by joining the mid-points of the sides, in order, is a rectangle.

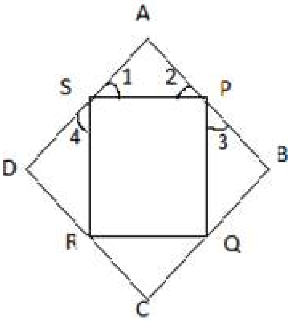
Answer

Given,

ABCD is a kite , in which

AB=AD and BC =CD

P,Q,R,S are mid points of side AB,BC,CD &DA



In ΔABC , P&Q are mid points of AB & BC

∴ PQ||AC , PQ = $\frac{1}{2}$AC ... ... (i)

In ΔADC , R & S are mid points of CD & AD

∴RS||AC and RS = 1/2 AC............(ii)

From (i) and(ii) we have

PQ||RS , PQ=RS

Since AB=AD

= $\frac{1}{2}$ AB = $\frac{1}{2}$AD

AP=AS..............(iii)

=∠1=∠2...............(iv)

Now in ΔPBQ and ΔSDR

PB= SD ∵ AD=AB = $\frac{1}{2}$AD = $\frac{1}{2}$AB

BQ = DR ∴ PB=SD

And PQ = SR ∵ PQRS is a parallelogram

So by sss congruency

ΔPBQ≅ΔSOR

∠3=∠4

Now, ∠3+SPQ+∠2 =180°

∠1+∠PSR+∠4 = 180°

∴ ∠3+∠SPQ+∠2= ∠1+∠PSR+∠4

∠SPQ=∠PSR (∠2=∠1 and ∠3=∠4)

∵∠SPQ+∠PSR = 180°

=2∠SPQ = 180° = ∠SPQ = 90°

Hence , PQRS is a parallelogram.

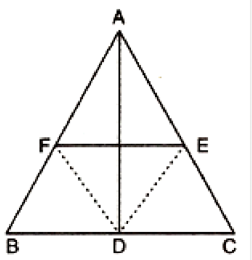
13. Question

Let ABC be an isosceles triangle in which AB=AC. If D, E, F be the mid-points of the sides BC, CA and AB respectively, show that the segment AD and EF bisect each other at right angles.

Answer

Given,

ABC is an isosceles triangle , D,E,F are mid points of side BC, CA,AB



∴AB||DF and AC||FD

ABDF is a parallelogram

AF=DE and AE = DF

$=\frac{1}{2}\text{AB} = \text{DE and } \frac{1}{2}\text{AC} = \text{DF}$

DE=DF (∵AB=AC)

AE=AF=DE=DF

ABDF is a rhombus

= AD and FE bisect each other at right angle.

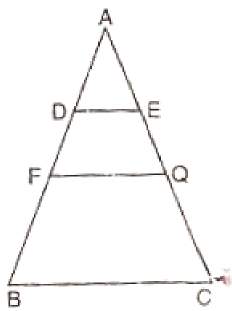
14. Question

ABC is a triangle. D is a point on AB such that AD=$\frac{1}{4}$AB and E is a point on AC such that AE= $\frac{1}{4}$AC. Prove that DE=$\frac{1}{4}$BC.

Answer

Given,

Let P and Q be the mid points of AB and AC respectively



Then, PQ ||BC and PQ=$\frac{1}{2}\text{BC}$................(i)

In ΔAPQ, D and E are mid points of AP and AQ resp.

∴DE||PQ , DE= $\frac{1}{2}\text{PQ}$ ....(ii)

From (i) and(ii)

=DE= $\frac{1}{2}\text{PQ} = \frac{1}{2}\left(\frac{1}{2}\text{BC}\right)$

= DE =$\frac{1}{4}\text{BC proved}$

15. Question

In Fig. 14.99, ABCD is a parallelogram in which P is the mid-point of DC and Q is a point on AC such that CQ= $\frac{1}{4}$ AC. If PQ produced meets BC at R, Prove that R is a mid-point of BC.

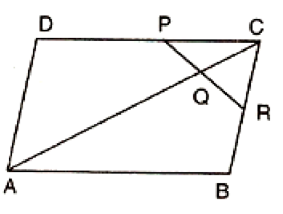
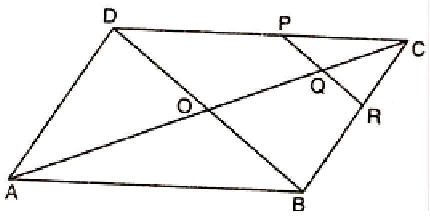


Fig. 14.99

Answer

Given,

Join B and D suppose AC and BD cut at D



Then, OC = $\frac{1}{2}\text{AC}$

Now, CQ = $\frac{1}{4}\text{AC}$

= CQ = $\frac{1}{2}\left(\frac{1}{2}\text{AC}\right) = \frac{1}{2} \times \text{OC}$

In ΔDCO, P & Q are midpoints of DC & OC

∴ PQ$||$PO

Also in ΔCOB , Q is mid point of OC and QR||OB

∴ R is mid point of BC

16. Question

In Fig. 14.100, ABCD and PQRC are rectangles and Q is the mid-point of AC. Prove that

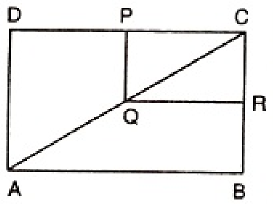


Fig. 14.100

(i) DP = PC (ii) PR = $\frac{1}{2}$AC.

Answer

(i) In ΔADC , Q is mid point of AC such that

PQ||AD

∴ P is mid point of DC

= DP= DC (converse of mid point theorem)

(ii) Similarly, R is the mid point of BC

= PR= $\frac{1}{2}$ BD

PR= $\frac{1}{2}\text{AC}$ ∵ diagonals of rectangle are equal

Proved.

17. Question

ABCD is a parallelogram, E and F are the mid-points of AB and CD respectively. GH is any line intersecting AD,EF and BC at G, P and H respectively. Prove that GP=PH.

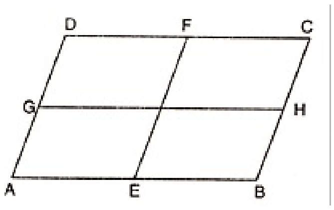
Answer

Since E and F are midpoints of AB and CD

∴ AE = BE = $\frac{1}{2}$ AB

And CF = DF = $\frac{1}{2}$ CD

∵ AB = CD



∴$\frac{1}{2}$AB $=\frac{1}{2}$CD

= BE = CF

∴ BEFC is a parallelogram

= BE||EF and BF= PH---------------(i)

Now, BC||EF

=AD||EF ∵ BC||AD as ABCD is a parallelogram

= AEFD is a parallelogram

= AE = GP

But is the midpoint of AB

∴ AE=BE

= GP=PH proved

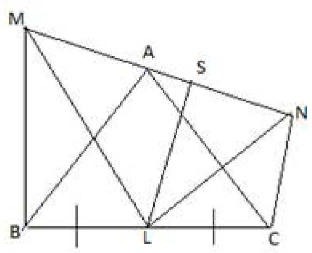
18. Question

BM and CN are perpendiculars to a line passing through the vertex A of a triangle ABC. If L is the mid-point of BC, prove that LM=LN.

Answer

draw LS perpendicular to line MN

∴ the line BM , LS,CN being the same perpendiculars , on line MN are parallel to each other



We have , BL=LC (L is mid point of BC)

Using intercept theorem,

MS = SN..................(i)

Now in ΔMLS and ΔLSN

MS=SN

∠LSM=∠LSN = 90° (LS perpendicular to MN) and SL=LS is common

∴ΔMLS ≅ΔLSN (SAS congruency)

∴ LM= LN proved

19. Question

Show that the line segments joining the mid-points of the opposite sides of a quadrilateral bisect each other.

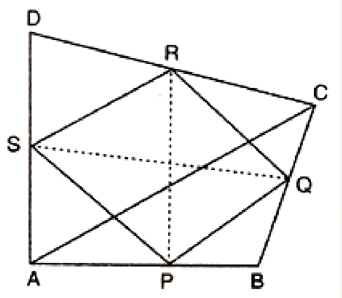
Answer

ABCD is a quadrilateral

P,Q,R,S are mid points of sides AB,BC,CD and DA

In ΔABC , P and PQ are the mid points of AB and AC respectively

So, by using mid point theorem,



PQ||AC and PO $= \frac{1}{2}$ AC..................(i)

Similarly in ΔBCD

RS||AC and RS $= \frac{1}{2}$ AC ... ... (ii)

From rquation (i) and (ii)

PQ||RS and PQ=RS

Similarly, we have

PS∥QR and PS=QR

Hence , PQRS is a parallelogram.

Since, diagonals of a paralleleogram bisects each other

Hence, PR and QS bisect each other proved

20. Question

Fill in the blanks to make the following statements correct:

(i) The triangle formed by joining the mid-points of the sides of an isosceles triangle is.....

(ii) The triangle formed by joining the mid-points of the sides of a right triangle is.....

(iii) The figure formed by joining the mid-points of consecutive sides of a quadrilateral is......

Answer

(i) isosceles.

(ii) Right triangle.

(iii) Parallelogram.

CCE - Formative Assessment

1. Question

In a parallelogram ABCD, write the sum of angles A and B.

Answer

Given,

In parallelogram ABCD

$\angle A+\angle B = 180°$ (Adjacent angles of a parallelogram are supplementary)

2. Question

In a parallelogram ABCD, if $\angle D=115°$, then write the measure of $\angle A$.

Answer

Given,

In parallelogram ABCD

$\angle D = 115°$ Given

$\because \angle A$ & $\angle D$ are adjacent angles of parallelogram

$\therefore \angle A + \angle D = 180°$

$\angle A = 180°-115° = 65°$

3. Question

PQRS is a square such that PR and SQ intersect at O. State the measure of $\angle POQ$.

Answer

Given,

In square PQRS

We know that diagonals of a square bisects each other at 90°

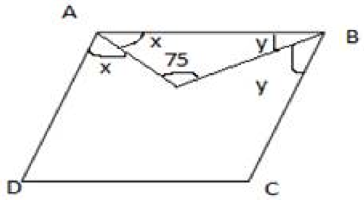
Hence, $\angle POQ = 90°$

4. Question

In a quadrilateral ABCD, bisectors of angles A and B intersect at O such that $\angle AOB=75°$, then write the value of $\angle C+\angle D$.

Answer

Given,



In quadrilateral ABCD

$\angle x+\angle y+75° = 180°$ (angle sum property of triangle)

$= \angle x+\angle y = 180°-75° = 105°$

$=2(\angle x+\angle y) = 2\times105° = 210°$

$\therefore \angle C+\angle D = 360°-210° = 150°$

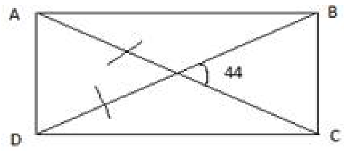
5. Question

The diagonals of a rectangle ABCD meet at O. If ∠BOC=44°, find ∠OAD.

Answer

Given,

ABCD is a rectangle



Diagonals meets at O, ∠BOC = 44°

∵ ∠AOD = ∠BOC (vertically opposite angles)

= ∠AOD = 44°

AO = OD

∠OAD=∠ODA (Angles facing same side)

So, ∠OAD = $\frac{180°-44°}{2} = \frac{136°}{2} = 68°$

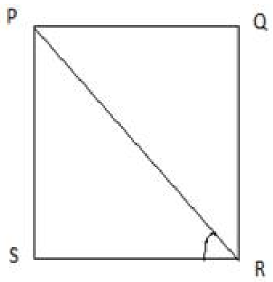
6. Question

If PQRS is a square, then write the measure of ∠SRP.

Answer

Given,

PQRS is a square.



We know that each angle of a square is 90° and diagonals of square bisect the angles

Hence , ∠SRP = $\frac{90°}{2} = 45°$

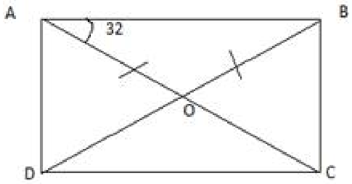
7. Question

If ABCD is a rectangle with ∠BAC=32°, find the measure of ∠DBC.

Answer

Given,

ABCD is a rectangle



∠BAC = 32°

∵ we know that diagonals of a rectangle bisects each other

Hence , AO = BO

And, ∠DBA = ∠BAC = 32° (angles infront of same sides)

∵ ∠DBC+∠DBA = 90°

∴ ∠DBC = 90° - 32° = 58°

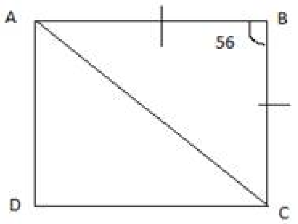
8. Question

If ABCD is a rhombus with ∠ABC=56°, find the measure of ∠ACD.

Answer

Given,

ABCD is a rhombus



∠ABC = 56°

Since , AB= BC

∴ ∠BAC = ∠BCA = $\frac{1}{2}\,(180° - 56°) = \frac{124°}{2} = 62°$

∵ AB=BC

∠ACD=∠BAC = 62°

∵ AB||BC

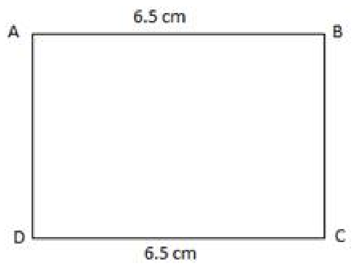
9. Question

The perimeter of a parallelogram is 22 cm. If the longer side measure 6.5 cm, what is the measure of shorter side?

Answer

Given,

Perimeter of a parallelogram = 22cm



Longer side = 6.5 cm

∵ AB+BC+CD+DA = 22cm

Let length of shorter side= x cm

= 2x + 2×6.5 = 22

= 2x = 22-13 = 9

= X = $\frac{9}{2} = 4.5$ cm

10. Question

If the angles of a quadrilateral are in the ratio 3:5:9:13, then find the measure of the smallest angle.

Answer

Given,

Ratio of angles of quadrilateral = 3:5:9:13

Let sides are = 3x ,5x ,9x, 13x

= 3x+5x+9x+13x = 360° (angle sum property of quadrilateral)

= 30x = 360°

= x = $\frac{360°}{30} = 12$

So, length of smallest angle = 3x = 3×12 =36°

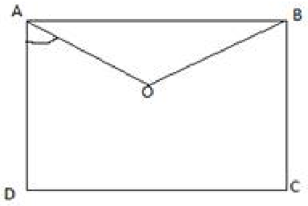
11. Question

If the bisectors of two adjacent angles A and B of a quadrilateral ABCD intersect at a point O such that ∠C+∠D=k∠AOB, then find the value of k.

Answer

Given ,

ABCD is a quadrilateral



∠C+∠D = k ∠AOB

∵∠D+∠C = k

= ∠A+∠B = 360°- k

= ∠OAB+∠OBA = $\frac{360°-k}{2}$

= $360° - \frac{360°-k}{2} = \frac{k}{2} = k = 2$

12. Question

In a parallelogram ABCD, if ∠A=(3x-20)°, ∠B = (y+15)° and ∠C = (x+40)°, then find the values of x and y.

Answer

Given,

In parallelogram ABCD

Opposite Angles are equal.

∴ ∠ A = ∠ C

⇒ 3x-20 = x + 40

⇒ 2x = 60

⇒ x = 30

Consecutive angles are supplementary (A + B = 180°).

⇒ 3x – 20 + y + 15 = 180

⇒ 3x + y = 185

⇒ 3 × 30 + y = 185

⇒ y = 185 – 90 = 95

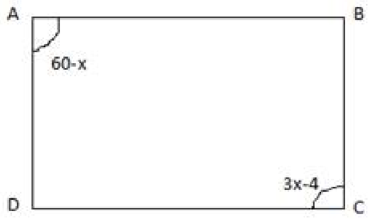
13. Question

If measures opposite angles of a larallelogram are (60-x)° and (3x-4)°, then find the measures of angles of the parallelogram.

Answer

Given,

Measure of opposite angles of parallelogram = (60-x°) , (3x-4°)



= 60-x° = 3x-4° (opposite angles of parallelogram)

= 4x = 56°

= x = $\frac{56°}{4} = 14$

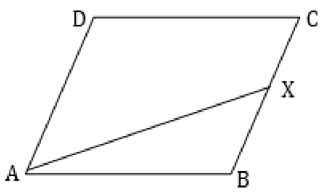
Hence angles of parallelograms = 60- 14° = 46°

Other two angles = 180-46 = 134°

14. Question

In a parallelogram ABCD, the bisector of ∠A also bisects BC at X. Find AB : AD.

Answer



Given,

In parallelogram ABCD ,

Bisector of ∠A bisects BC at X

∵ AD||BC and AX cuts them so

∠DAX = ∠AXB (alternate angles)

∠DAX = ∠XAB (AX is bisector of ∠A)

∴∠AXB = ∠XAB

AB= BX (sides opposite of equal angles)

Now, $\frac{AB}{AD} = \frac{BX}{BC}$

= $\frac{AB}{AD} = \frac{BX}{2BX}$ (∵ X is mid point of BC)

= $\frac{AB}{AD} = \frac{1}{2} = AB: AD = 1: 2$

15. Question

In Fig. 14.111, PQRS is an isosceles trapezium. Find x and y.

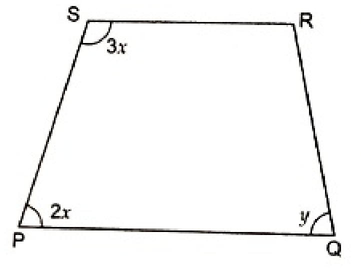


Fig. 14.111

Answer

Given,

PQRS is an isosceles trapezium

PS = RQ (Given)

= ∠P+∠S = 180° (sum of adjacent angles are supplementary)

= 2x + 3x = 180°

= 5x = 180°

= x = $\frac{180°}{5} = 36°$

∵∠P =∠Q ∵ PS=RQ

= 2x = y

= 2×36 = y

= y = 72°

16. Question

In Fig. 14.112, ABCD is a trapezium. Find the values of x and y.

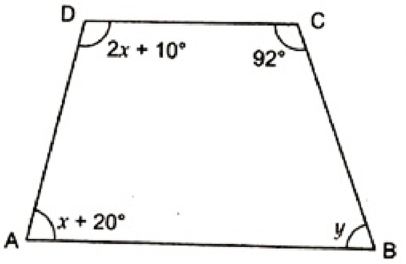


Fig. 14.112

Answer

Given,

ABCD is a trapezium

= ∠A+∠D = 180°

=2x+10°+x+20° = 180°

= 3x+30°= 180°

= x= $\frac{150°}{3} = 50°$

∠B+∠C = 180°

= y + 92° = 180°

= y = 180°-92° = 88°

17. Question

In Fig. 14.113, PQRS is a rhombus in which the diagonal PR is produced to T. If ∠SRT=152°, find x,y and z.

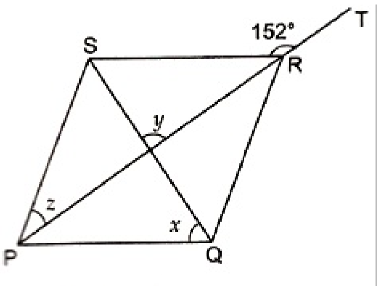


Fig. 14.113

Answer

Given,

PQRS is a rhombus

∠SRT = 152°

We know that diagonals of a rhombus bisects each other at 90°

Hence , ∠SOR = 90° = y = 90°

∠SRT+∠SRO= 180° (linear pair of angles)

= 152°+∠SRO = 180°

∠SRO = 180° -152°= 28°

NOW , ∠SRO = z ∵SR=SP

= z = 28°

And , ∠RSO+∠SRO + y = 180° (angle sum property of triangle)

= ∠RSO+28°+90°= 180°

= ∠RSO = 180°-118° = 62°

= ∠X = ∠RSO = 62° (alternate angles)

18. Question

In Fig. 14.114, ABCD is a rectangle in which diagonal AC is produced to E. If ∠ECD=146°, find ∠AOB.

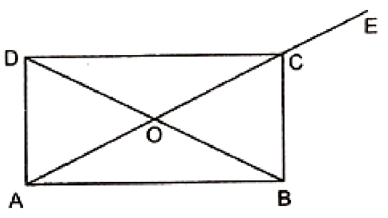


Fig. 14.114

Answer

Given,

ABCD is a rectangle

∠ECD = 146°

= ∠ECD+∠DCO = 180° (Linear pair of angles)

=146°+∠DCO = 180°

= ∠DCO = 180° - 146° = 34°

AND, ∠BOC = 180°- ∠OCB-∠OBC ∵ ∠OCB = ∠OBC

=∠BOC = 180°-34°-34° = 112°

∠BOC+∠AOB = 180° (Linear pair)

= 112°+ ∠AOB = 180°

= ∠AOB = 180°- 112° = 68°

19. Question

In Fig. 14.115, ANCD and AEFG are two parallelograms. If ∠C=58°, find ∠F.

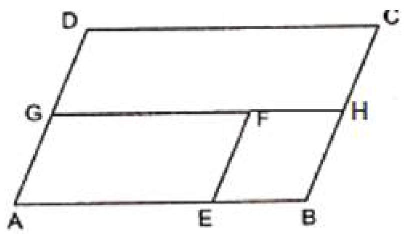


Fig. 14.115

Answer

Given,

ABCD & AEFG are two parallelograms

∠C = 58°

∵ AB││CD , AE││FG ,BC││AD , EF││AG

GF produced to H so GH││AB

= ∠C = ∠H (corresponding angles)

= ∠H = 58°

AD││BC and GH cuts them

Hence , ∠F = ∠H (corresponding angles)

∠F = 58°.

20. Question

Complete each of the following statements by means of one of those given in brackets against each:

(i) If one pair of opposite sides are equal and parallel, then the figure is ………. (parallelogram, rectangle, trapezium)

(ii) If in a quadrilateral only one pair of opposite sides are parallel, the quadrilateral is …………. (square, rectangle, trapezium)

(iii) A line drawn from the mid-point of one side of a rriangle….. another side intersects the third side at its mid-point. (perpendicular to, parallel to, to meet)

(iv) If one angle of a parallelogram is a right angle, then it is necessarily a ….. (rectangle, square, rhombus)

(v) Consecutive angles of a parallelogram are ……….. (Supplementary, complementary)

(vii) If opposite angles of a quadrilateral are equal, then it is necessarily a ……. (parallelogram, rhombus, rectangle)

(vi) If both pairs of opposite sides of a quadrilateral are equal, then it is necessarily a ……… (rectangle, parallelogram, rhombus)

(viii) If consecutive sides of a parallelogram are equal, then it is necessarily a …….. (kite, rhombus, square)

Answer

(i) parallelogram

(ii) trapezium

(iii) parallel toWW

(iv) rectangle

(v) supplementary

(vi) parallelogram

(vii) parallelogram

(viii) rhombus

1. Question

The opposite sides of a quadrilateral have

A. no common points

B. one common point

C. two common points

D. infinitely many common points

Answer

no common points

2. Question

Two consecutive sides of a quadrilateral have

A. no common points

B. one common point

C. two common points

D. infinitely many common points

Answer

one common point

3. Question

PQRS is a quadrilateral. PR and QS intersect each other at O. In which of the following cases, PQRS is a parallelogram?

A. ∠P=100°, ∠Q=80°, ∠R=100°

B. ∠P=85°, ∠Q=85°, ∠R=95°

C. PQ=7 cm, QR=7 cm, RS=8 cm, SP=8 cm

D. OP=6.5 cm, OQ=6.5 cm, OR=5.2 cm, OS=5.2 cm

Answer

$\angle P=100^\circ$, $\angle Q=80^\circ$, $\angle R=100^\circ$

4. Question

Which of the following quadrilateral is not a rhombus?

A. All four sides are equal

B. Diagonals bisect each other

C. Diagonals bisect opposite angles

D. One angle between the diagonals is 60°

Answer

one angle between the diagonals is 60°

5. Question

Diagonals necessarily bisect opposite angles in a

A. rectangle

B. parallelogram

C. isosceles trapezium

D. square

Answer

square

6. Question

The two diagonals are equal in a

A. parallelogram

B. rhombus

C. rectangle

D. trapezium

Answer

rectangle

7. Question

We get a rhombus by joining the mid-points of the sides of a

A. parallelogram

B. rhombus

C. rectangle

D. triangle

Answer

rectangle

8. Question

The bisectors of any two adjacent angles of a parallelogram intersect at

A. 30°

B. 45°

C. 60°

D. 90°

Answer

90°

9. Question

The bisectors of the angle of a parallelogram enclose a

A. parallelogram

B. rhombus

C. rectangle

D. square

Answer

rectangle

10. Question

The figure formed by joining the mid-points of the adjacent sides of a quadrilateral is a

A. parallelogram

B. rectangle

C. square

D. rhombus

Answer

parallelogram

11. Question

The figure formed by joining the mid-points of the adjacent sides of a rectangle is a

A. square

B. rhombus

C. trapezium

D. none of these

Answer

rhombus

12. Question

The figure formed by joining the mid-points of the adjacent sides of a rhombus is a

A. square

B. rectangle

C. trapezium

D. none of these

Answer

rectangle

13. Question

The figure formed by joining the mid-points of the adjacent sides of a square is a

A. rhombus

B. square

C. rectangle

D. parallelogram

Answer

square

14. Question

The figure formed by joining the mid-points of the adjacent sides of a parallelogram is a

A. rectangle

B. parallelogram

C. rhombus

D. square

Answer

parallelogram

15. Question

If one side of a parallelogram is 24° less than twice the smallest angle, then the measure of the largest angle of the parallelogram is

A. 176°

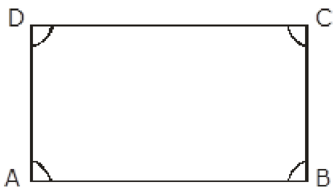
B. 68°

C. 112°

D. 102°

Answer

Let angles of parallelogram are ∠A, ∠B, ∠C, ∠D



Let smallest angle = ∠A

Let largest angle = ∠B

= ∠B = 2∠A – 24°............(i)

∠A+∠B = 180° [adjacent angle of parallelogram]

So, ∠A+2∠A -24° = 180°

= 3∠A = 180°+24° = 204°

=∠A = $\frac{204°}{3} = 68°$

= ∠B = 2×68°-24° = 112°

16. Question

In a parallelogram ABCD, if ∠DAB=75° and ∠DBC=60°, then ∠BDC=

A. 75°

B. 60°

C. 45°

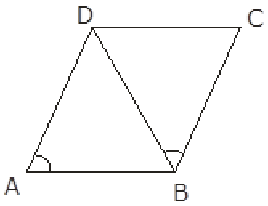
D. 55°

Answer

Given ,

In parallelogram ABCD,

∠DAB = 75°



∠DBC = 60°

∵ ∠DAB= ∠BCD [opposite angles of parallelogram]

∠BCD = 75°

Now in ΔBDC

= ∠DBC+∠BDC+∠BCD = 180°

= 60°+∠BDC+75° = 180°

=∠BDC = 180° - 135°

=∠BDC = 45°.

17. Question

ABCD is a parallelogram and E and F are the centroids of triangles ABD and BCD respectively, then EF=

A. AE

B. BE

C. CE

D. DE

Answer

Given,

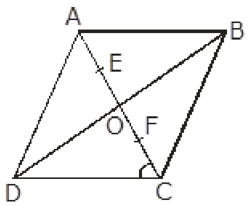
ABCD is a parallelogram

E & F are centroids of ΔABD & ΔBCD respectively

We know that diagonals of parallelogram bisect each other & centroid of a median divides it in 2:1

So, in ΔABD ,

$= \frac{AB}{EO} = \frac{2}{1}$ OR $EO = \frac{1}{3}AO$ & $AE = \frac{2}{3}$ AO ... ... (I)



Similarly, $FO = \frac{1}{3}CO$ & $CF = \frac{2}{3}CO$ ... ... (II)

= AO = CO

$= \frac{1}{3}AO = \frac{1}{3}$ CO

From equations (i) & (ii)

EO = FO

EF = 2 FO.............(III)

AE = CF......(IV)

From equation (i)

$= AE = \frac{2}{3}AO = \frac{2}{3}\ CO$

$=AE = \frac{2}{3}(CF + FO)$

$= AE = \frac{2}{3}(AE + FO)$ from equation (iv)

$= AE = \frac{2}{3}AE + \frac{2}{3}FO$

$=AE - \frac{2}{3}AE = \frac{2}{3}FO$

$= \frac{1}{3}AE = \frac{2}{3}FO$

$= \frac{1}{3}AE = \frac{1}{3}EF$ from equation (iii)

= AE= EF

18. Question

ABCD is a parallelogram M is the mid-point of BD and BM bisects ∠B. Then, ∠AMB=

A. 45°

B. 60°

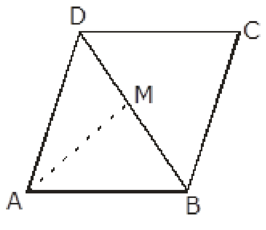
C. 90°

D. 75°

Answer

Given,

ABCD is a parallelogram,



M is mid point of BD

BM bisects ∠B

∵ ∠A+∠B = 180° [adjacent angles of parallelogram are supplementary]

In ΔAMB , $\angle AMB + \frac{1}{2}\angle A + \frac{1}{2}\angle B = 180°$

$= \angle AMB + \frac{1}{2}(\angle A + \angle B) = 180°$

$=\angle AMB + \frac{1}{2}\times 180° = 180°$

= ∠AMB = 180° - 90° = 90°

19. Question

ABCD is a parallelogram and E is the mid point of BC.DE and AB when produced meet at F. Then, AF=

A. $\frac{3}{2}$AB

B. 2 AB

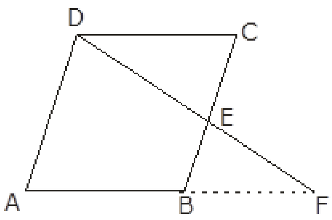
C. 3 AB

D. $\frac{5}{4}$AB

Answer

Given,

ABCD is a parallelogram



E is mid point of BC

DE & AB after producing meet at F

In ΔECD & ΔBEF ,

∠BEF = ∠CED [vertically opposite angles]

BE = EC

∠EDC = ∠EFB [alternate angles]

∴ ΔECD ≅ ΔBEF

So, CD= BF

∵ AB=CD

Thus, AF= AB+ BF

= AF = AB + CD

= AF = AB+AB

= AF = 2AB

20. Question

If an angle of a parallelogram is two-third of its adjacent angle, the smallest angle of the parallelogram is

A. 108°

B. 54°

C. 72°

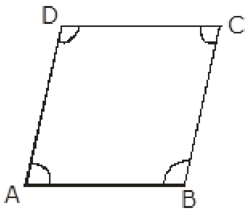
D. 81°

Answer

Given,

In parallelogram ABCD

∠A+∠B = 180° [adjacent angles of parallelogram are supplementary]



$\angle A = \frac{3}{2}\angle B$

So, $\frac{3}{2}\angle B + \angle B = 180°$

$= \frac{5}{2}\angle B = 180°$

$= \angle B = \frac{180° \times 2}{5} = 72°$

$\angle A = \frac{3}{2} \times 72° = 108°$

Thus smallest angle of parallelogram is 72°

21. Question

If the degree measures of the angles of quadrilateral are 4x, 7x, 9x and 10x, what is the sum of the measures of the smallest angle and largest angle?

A. 140°

B. 150°

C. 168°

D. 180°

Answer

Given,

ABCD is a parallelogram,

Angles of quadrilateral 4x , 7x , 9x , 10x

= 4x+7x+9x+10x = 360° [angle sum property of quadrilateral]

= 30x = 360°

$= x = \frac{360°}{30} = 12°$

Hence, sum of smallest and largest angles = 4x+10x = 4×12+10×12

= 48°+120° = 168°

22. Question

In a quadrilateral ABCD, ∠A+∠C is 2 times ∠B+∠D. If ∠A= 140° and f∠D = 60°, then ∠B=

A. 60°

B. 80°

C. 120°

D. none of these

Answer

Given,

ABCD is a parallelogram

∠A+∠C = 2(∠B+∠D)

∠A = 40°

∵ ∠A+∠B+∠C+∠D = 360° [angle sum property of quadrilateral]

= ∠A+∠C+∠B+∠D = 360°

= 2(∠B+∠D)+ ∠B+∠D = 360°

= 3(∠B+∠D) = 360°

= ∠B+∠D = $\frac{360°}{3} = 120°$

∵∠D= 60° [given]

∴ ∠B = 120°-60° = 60°

23. Question

If the diagonals of a rhombus are 18 cm and 24 cm respectively, then its side is equal to

A. 16 cm

B. 15 cm

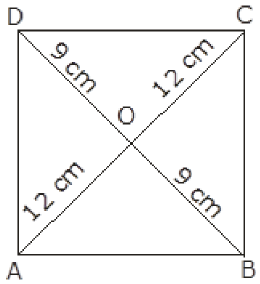
C. 20 cm

D. 17 cm

Answer

Given,

ABCD is a rhombus



AC=24 cm, BD = 18 cm

= AB=BC=CD=DA [side of rhombus]

We know that diagonals of rhombus bisect each other at 90°

In right Δ AOB

$AB^2 = BO^2+AO^2$

$AB^2= 12^2+9^2$ = 144+81 = 225

AB = $\sqrt{225} = 15\text{cm}$

Side of rhombus = 15 cm

24. Question

The diagonals AC and BD of a rectangle ABCD intersect each other at P. If ∠ABD =50°, then ∠DPC =

A. 70°

B. 90°

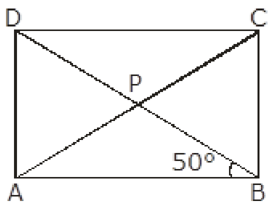
C. 80°

D. 100°

Answer

Given,

ABCD is a rectangle



Diagonals AC & BD intersect each other at P

∠ABD = 50°

∵ diagonals of rectangle bisect each other and are equal in length

=∠ABD= ∠PDC [alternate angles]

∠PDC=∠PCD = 50°

In ΔDPC

=∠DPC+∠PCD+∠PDC = 180°

= ∠DPC+50°+50°= 180°

= ∠DPC = 180°-100° = 80°

25. Question

ABCD is a parallelogram in which diagonal AC bisects ∠BAD. If ∠BAC =35°, then ∠ABC =

A. 70°

B. 110°

C. 90°

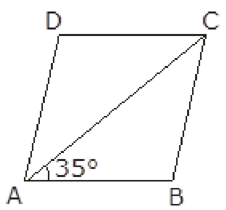
D. 120°

Answer

Given,

ABCD is a parallelogram

Diagonal AC bisects ∠BAD



∠BAC = 35°

∵∠A+∠B = 180° …………(i) [angle sum property of quadrilateral]

∠A = 2∠BAC = 2×35° = 70°

Putting value of ∠A in equation (i)

= 70°+∠B = 180°

= ∠B = 180°-70° = 110°

∠ABC = 110°

26. Question

In a rhombus ABCD, if ∠ACB =40°, then ∠ADB =

A. 70°

B. 45°

C. 50°

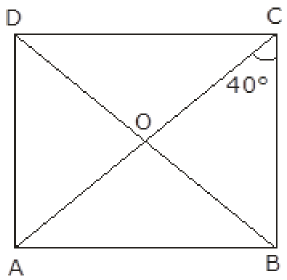
D. 60°

Answer

Given,

ABCD is a rhombus

∠ACB = 40°



∵ ∠DAC =∠ACB = 40° [alternate angles]

∠AOD = 90° [diagonals of rhombus are perpendicular to each other]

In ΔAOD

∠AOD+∠ADO+∠DAO = 180°

∠ADO+90°+40° = 180°

= ∠ADO = 180°- 130° = 50°

=∠ADO=∠ADB = 50°

27. Question

In ΔABC, ∠A =30°, ∠B=40° and ∠C=110°. The angles of the triangle formed by joining the mid-points of the sides of this triangle are

A. 70°, 70°, 40°

B. 60°, 40°, 80°

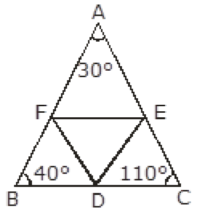
C. 30°, 40°, 110°

D. 60°, 70°, 50°

Answer

Given,

In ΔABC



∠A=30°,∠B=40°,∠C=110°

In figure, BDEF,DCEF,DEAF are parallelograms so,

∠B = ∠E = 40° [∵∠B&∠E are opposite angles of parallelogram BDEF]

∠C=∠F = 110° [∵ ∠C &∠F are opposite angles of parallelogram DCEF]

∠A=∠D =30° [∵∠A &∠D are opposite angles of parallelogram DEAF]

Hence, ∠D = 30°

∠E = 40°

∠F = 110°

28. Question

The diagonals of a parallelogram ABCD intersect ay O. If ∠BOC =90° and ∠BDC=50°, then ∠OAB =

A. 40°

B. 50°

C. 10°

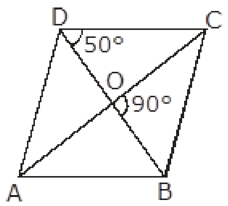
D. 90°

Answer

Given,

ABCD is a parallelogram

Diagonals of parallelogram intersects at O



∠BOC = 90° , ∠BDC = 50°

∵ ∠BOC+∠AOB = 180° [Linear pair of angles]

90°+∠AOB = 180°

=∠AOB = 180°-90° = 90°

∠BDC = ∠OBA = 50° [Alternate angles]

In ΔAOB

∠AOB+∠OBA+∠OAB = 180°

= 90°+50°+∠OAB = 180°

= ∠OAB = 180°-140° = 40°

29. Question

ABCD is a trapezium in which AB||DC. M and N are the mid-points of AD and BC respectively, If AB=12cm, MN=14 cm, then CD=

A. 10 cm

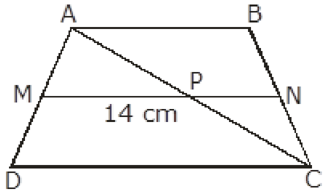
B. 12 cm

C. 14 cm

D. 16 cm

Answer

Given,



ABCD is a trapezium

AB||DC

M , N are mid points of AD & BC

AB = 12cm , MN = 14 cm

∵ AB||MN||CD [M, N are mid points of AD &BC]

MP = NP

By mid point theorem,

MP = $\frac{1}{2}\mathrm{CD\ AND\ NP} = \frac{1}{2}\mathrm{AB}$

∴MN = $\frac{1}{2}(\mathrm{AB} + \mathrm{CD})$

= 14 = $\frac{1}{2}(12 + \mathrm{CD}) = \ \mathrm{CD} = 28 - 12 = 16\ \mathrm{cm}$

30. Question

Diagonals of a quadrilateral ABCD bisect each other. If ∠A =45°, then ∠B =

A. 115°

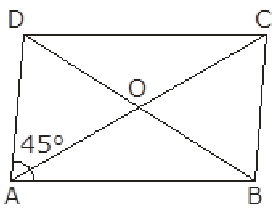
B. 120°

C. 125°

D. 135°

Answer

Given,



ABCD is a quadrilateral

∠A = 45° ,

∵ diagonals of quadrilateral bisects each other hence ABCD is a parallelogram,

= ∠A +∠B = 180°

=45°+∠B = 180°

=∠B = 180°- 45° = 135°

31. Question

P is the mid point of side BC of a parallelogram ABCD such that ∠BAP =∠DAP. If AD=10 cm, then CD=

A. 5 cm

B. 6 cm

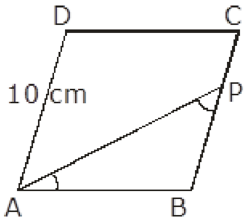
C. 8 cm

D. 10 cm

Answer

Given,

ABCD is a parallelogram,



P is mid point of side BC

∠BAP = ∠DAP

AD = 10cm

∵ AD||BC

∠DAP = ∠APB [alternate angles]

∠DAP = ∠BAP

AB = BP (side opposite to equal angles)

= BP $=\frac{1}{2}BC$

∴ AB $=\frac{1}{2}BC = \frac{1}{2}\times 10 = 5cm$

AB = CD = 5cm (sides of parallelogram)

Hence , CD = 5 cm

32. Question

In ΔABC, E is the mid-point of median AD such that BE produced meets AC at F. If AC = 10.5 cm, then AF=

A. 3 cm

B. 3.5 cm

C. 2.5 cm

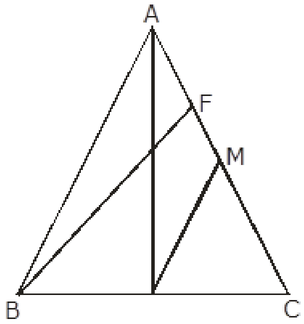
D. 5 cm

Answer

Given,

In ΔABC

E is mid point of median AD



AC = 10.5 cm

Draw DM||EF

∵ E is mid point of AD so F is mid point of AM

AF= FM ....(i)

In ΔBFC

EF||DM

SO, FM = MC ....(ii)

From(i) &(ii)

AF= MC.................(iii)

AC = AF+MC+FM

= AC= AF+AF+AF From (i) (ii) &(iii)

AC = 3AF

AF =$\frac{1}{3}AC$

AF = $\frac{1}{3}\times 10.5 = 3.5 \text{ cm}$