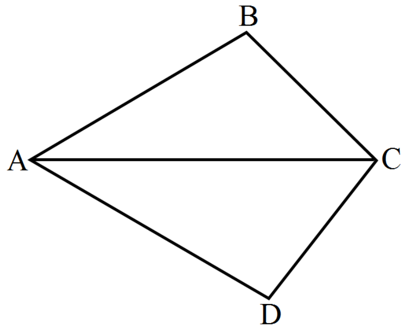
*** Choose the right answer from the given options. [1 Marks Each]** **[10]**

1. In the adjoining figure, $\triangle ABC \cong \triangle ADC$. If $\angle BAC = 30^\circ$ and $\angle ABC = 100^\circ$ then $\angle ACD$ is equal to:



(A) 80° (B) 60° (C) 30° (D) 50°

Ans. :

d. 50°

Solution:

In triangle ABC, $\angle BAC = 30^\circ$ and $\angle ABC = 100^\circ$ (Given)

$\angle BAC + \angle ABC + \angle BCA = 180^\circ$

$\angle BAC = 50^\circ$

Also $\angle ACD = 50^\circ$ (Since, $\triangle ABC \cong \triangle ADC$)

2. If $\angle OCA = 80^\circ$, $\angle COA = 40^\circ$, and $\angle BDO = 70^\circ$ then x° + y° = ?

(A) 270° (B) 210° (C) 230° (D) 190°

Ans. :

c. 230°

Solution:

In the given figure, $\angle BOD = \angle COA$ (Vertically opposite angles)

$\therefore \angle BOD = 40^\circ \ldots (i)$

In $\triangle ACO$

$\angle OAE = \angle OCA + \angle COA$ (Exterior angle of a triangle is equal to the sum of two opposite interior angles)

$\Rightarrow x^\circ = 80^\circ + 40^\circ = 120^\circ \ldots$ (ii)

In $\angle BDO$,

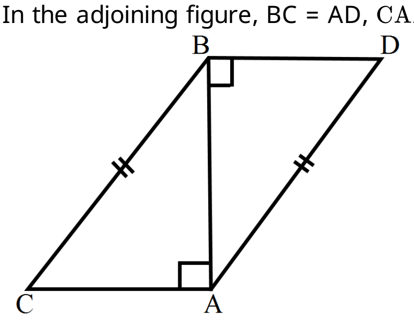
$\angle DBF = \angle BDO + \angle BOD$ (Exterior angle of a triangle is equal to the sum of two opposite interior angles)

$\Rightarrow y^\circ = 70^\circ + 40^\circ = 110^\circ \ldots$ (iii)

Adding (2) and (3) we get

$x^\circ + y^\circ = 120^\circ + 110^\circ = 230^\circ$

3. In the adjoining figure, BC = AD, $CA \perp AB$ and $BD \perp AB$. The rule by which $\triangle ABC \cong \triangle BAD$ is:



(A) ASA (B) RHS (C) SSS (D) SAS

Ans. :

b. RHS

Solution:

In $\triangle ABC$ and $\angle BAG = \angle ABD$

BAD, we have (Right angles)

BC = AD (Hypotentuses and Given)

AB = AB (conunon in both)

Hence, $\triangle ABC \cong \triangle BAD$ by RHS criterion.

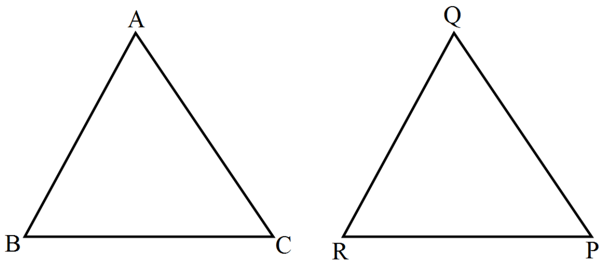
4. If $\triangle ABC \cong \triangle PQR$ then which of the following is not true?

(A) BC = PQ (B) AC = PR (C) BC = QR (D) AB = PQ

Ans. :

a. BC = PQ

Solution:



Since ABC is not congruent to RPQ, BC = PQ is not true.

5. If two acute angles of a right triangle are equal, then each acute is equal to:

(A) 30° (B) 45° (C) 60° (D) 90°

Ans. :

b. 45°

Solution:

Let the measure of each acute angle of a triangle be x°.

Then, we have

x° + x° + 90° = 180°

i.e. 2x° = 90°

i.e. x° = 45°

6. In $\triangle ABC$, if $\angle B = 30^\circ$ and $\angle C = 70^\circ$, then which of the following is the longest side?

(A) AB or AC (B) BC (C) AB (D) AC

Ans. :

b. BC

Solution:

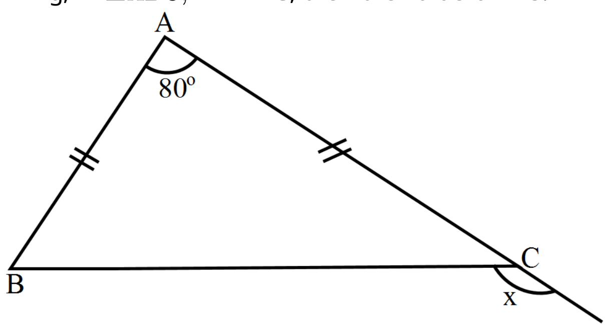
Since the sum of all sides of a triangle is 180°.

So, $\angle C = 70^\circ$, $\angle B = 30^\circ$, $\angle A = 80^\circ$.

We have a theorem which states that the side opposite to the greatest angle is the longest.

So, the side opposite to angle A is the longest.

7. In fig, in $\triangle ABC$, AB = AC, then the value of x is:



(A) 100° (B) 80° (C) 120° (D) 130°

Ans. :

d. 130°

Solution:

Triangle ABC is an iscosceles triangle and hence in the triangle other two angles are 50 and 50.

Therefore,

X = 180 - 50 = 130

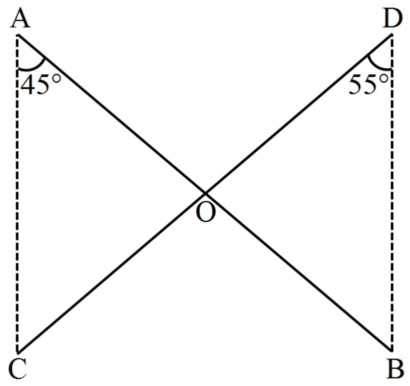
8. Line sgements AB and CD intersect at O such that $AC || DB$. If $\angle CAB = 45^\circ$ and $\angle CDB = 55^\circ$, then $\angle BOD =$

(A) 80° (B) 90° (C) 100° (D) 135°

Ans. :

a. 80°

Solution:



$AC || DB$
And, AB is transverse to these parallel lines
So, $\angle CAB = \angle ABD$ (Alternate angles)
$\Rightarrow \angle ABD = 45°$
Now In $\triangle BOD$
$\angle BOD + \angle ODB + \angle DBA = 180°$
$\angle DBA = \angle ABD = 45°,\ \angle ODB = 55°$
So, $\angle BOD = 180° - 45° - 55°$
$= 80°$

9. Two sides of a triangle are oflengths 5cm and 1.5cm. The length of the third side of the triangle cannot be:

(A) 3.6cm (B) 3.8cm (C) 4cm (D) 3.4cm

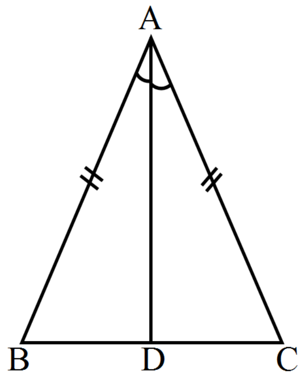
Ans. :

d. 3.4cm

Solution:

Given that: Two sides of triangle are 5cm and 1.5cm. We know that the sum of two sides of the triangle is always greater than the third side. Hence, 3.4cm cannot be the third side. If it is the third side the sum of 3.4cm and 1.5cm will be smaller than 5cm, so, the triangle will not be possible.

10. In the adjoining figure, AB = AC and AD is bisector of $\angle A$. The rule by which $\triangle ABD \cong \triangle ACD$ is:



(A) SSS (B) SAS (C) AAS (D) ASA

Ans. :

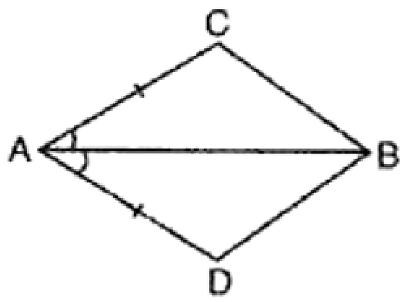
b. SAS

Solution:

In $\triangle ABD$ and $\triangle ADC$, we have
AB = AC (Given)
$\angle BAD = \angle DAC$ (Since AD, bisects $\angle A$)
AD = AD (conunon in both)
Hence, $\triangle ABD \cong \triangle ACD$ by SAS.

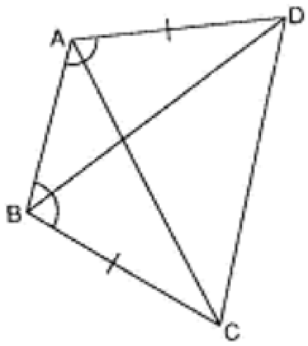
*** Answer the following short questions. [2 Marks Each]** **[10]**

11. In quadrilateral ABCD (See figure). AC = AD and AB bisects ∠A. Show that △ABC ≅ △ABD. What can you say about BC and BD?



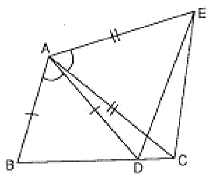
Ans. : Given: In quadrilateral ABCD, AC = AD and AB bisects ∠A.
To prove: ∠ABC ≅ △ABD
Proof: In △ABC and △ABD,
AC = AD [Given]
∠BAC = ∠BAD [∵ AB bisects ∠A]
AB = AB [Common]
∴ △ABC ≅ △ABD [By SAS congruency]
Thus BC = BD [By C.P.C.T.]

12. ABCD is a quadrilateral in which AD = BC and ∠DAB = ∠CBA : Prove that:
    i. △ ABD ≅ △ BAC
    ii. BD = AC
    iii. ∠ ABD= ∠ BAC



Ans. : In quadrilateral ACBD, we have AD = BC and ∠ DAB = ∠ CBA
   i. In Δ ABC and Δ BAC,
      AD = BC (Given)
      ∠DAB = ∠CBA (Given)
      AB = AB (Common)
      △ABD ≅ △BAC ...[By SAS Congruence]
   ii. Since ΔABD ≅ ΔBAC
      ⇒ BD = AC [By C.P.C.T.]
   iii. Since ΔABD ≅ ΔBAC
      ⇒ ∠ABD = ∠BAC [By C.P.C.T.]

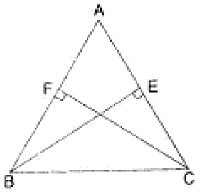
13. In figure, AC = AE, AB = AD and ∠BAD = ∠EAC. Show that BC = DE.



Ans. : Given : AC = AE, AB = AD and ∠BAD = ∠EAC.
To prove ; BC = DE
Proof : In DABC and DADE
AC = AE, AB = AD and ∠BAD = ∠EAC ...[Given]
∴ ∠BAD + ∠DAC = ∠DAC + ∠EAC ...[Adding ∠DAC to both sides]
∴ ∠BAC = ∠DAE ...(1)
AC = AE ...[Given]
∠BAC = ∠DAE ...[From (1)]
AB = AD ...[Given]

∴ DABC ≅ DADE ...[By SAS property]
∴ BC = DE ...[c.p.c.t.]

14. ABC is a triangle in which altitudes BE and CF to sides AC and AB are equal. Show that $\triangle \mathrm{ABE} \cong \triangle \mathrm{ACF}$, AB = AC i.e. △ABC is an isosceles triangle.

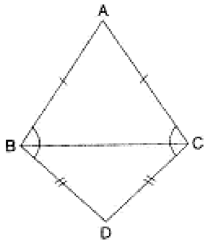


Ans. : Given : ABC is a triangle in which altitude BE and CF to side AC and AB are equal.
To Prove : $\triangle \mathrm{ABE} \cong \triangle \mathrm{ACF}$

i. AB = AC i.e. △ABC is an isosceles triangle.
Proof : BE = CF ...... [Given]
∠BAE = ∠CAF ...... [Common]
∠AFB = ∠AFC .... [Each 90^{o}]
∴ $\triangle \mathrm{ABE} \cong \triangle \mathrm{ACF}$ .... [By AAS property]

ii. $\triangle ABE \cong \triangle ACF$ .... [As proved]
∴ AB = AC . . .[c.p.c.t.]
∴ △ABC is an isosceles triangle.

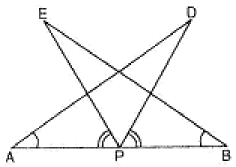
15. ABC and DBC are two isosceles triangles on the same base BC. Show that ∠ABD = ∠ACD.



Ans. : Given : ABC and DBC are two isosceles triangles on the same base BC.
To Prove : ∠ABD = ∠ACD.
Proof : As ABC is an isosceles triangle on the base BC
∴ ∠ABC = ∠ACB . . . .(1)
As ABC is an isosceles triangle on the base BC
∴ ∠DBC = ∠DCB . . . (2)
Adding the corresponding sides of (1) and (2)
∠ABC + ∠DBC = ∠ACB + ∠DCB
⇒ ∠ABD = ∠ACD

*** Answer the following questions. [3 Marks Each]** **[15]**

16. AB is a line segment and P is its mid-point. D and E are points on the same side of AB such that ∠BAD = ∠ABE and ∠EPA = ∠DPB.
Show that:
i. △DAP ≅ △EBP
ii. AD = BE



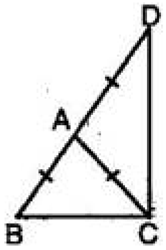
Ans. : Given: AB is a line segment and P is its mid-point. D and E are points on the same side of AB such that ∠BAD = ∠ABE and ∠EPA = ∠DPB.
To prove:

i. DDAP ≅ DEBP
ii. AD = BE

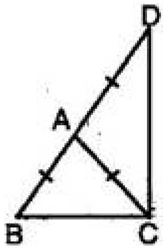
Proof :(ii)
∠EPA = ∠DPB ...[Given]
∠EPA + ∠EPD = ∠EPD + ∠DPB ...[Adding ∠EPD to both sides]
∠APD = ∠BPE ...(1)

In DDAP and DEBP
$\angle$DAP = $\angle$EBP ...[Given]
AP = BP ...[As P is the mid-point of the line AB]
$\angle$APD = $\angle$BPE ...[From (1)]
$\therefore$ DDAP $\cong$ DEBP proved ...[ASA property] ...(2)
(i) As DDAP $\cong$ DEBP ...[From (2)]
$\therefore$ AD = BE ...[c.p.c.t.]

17. Δ ABC is an isosceles triangle in which AB = AC. Side BA is produced to D such that AD = AB(See figure). Show that $\angle$ BCD is a right angle.



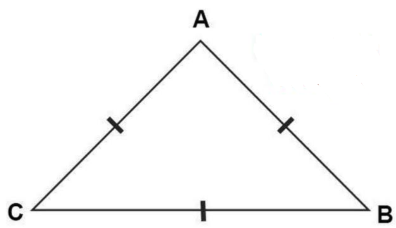
Ans. :



From figure & according to the question, in Δ ABC,
AB = AC ....(1)
$\Rightarrow\angle$ ACB = $\angle$ ABC ...(2) [Angles opposite to equal sides are equal]
Again given, AD = AB
But AB = AC [from (1)]
$\therefore$ AD = AB = AC
$\Rightarrow$ AD = AC..... (3)
Now in Δ ADC,
AD = AC [from (3)]
$\Rightarrow \angle ADC = \angle ACD$ ...(4) [Angles opposite to equal sides are equal]
In Δ BCD,
$\angle ABC + \angle BCD + \angle CDA = 180^\circ$ [Angle sum property]
$\Rightarrow \angle ACB + \angle BCD + \angle CDA = 180^\circ$ [Because $\angle$ ACB = $\angle$ ABC, from (2)]
$\Rightarrow \angle ACB + \angle ACB + \angle ACD + \angle CDA = 180^\circ$ [Because $\angle BCD = \angle ACB + \angle ACD$]
$\Rightarrow 2\angle ACB + \angle ACD + \angle CDA = 180^\circ$
$\Rightarrow 2\angle ACB + \angle ACD + \angle ACD = 180^\circ$ [Because $\angle$ ADC = $\angle$ ACD, see (4)]]
$\Rightarrow 2\angle ACB + 2\angle ACD = 180^\circ$
$\Rightarrow 2(\angle ACB + \angle ACD) = 180^\circ$ [Taking out 2 common]
$\Rightarrow 2\angle BCD = 180^\circ$ [Because, $\angle ACD + \angle ACB = \angle BCD$]
$\Rightarrow \angle BCD = 90^\circ$
Hence $\angle$ BCD is a right angle.

18. Show that the angles of an equilateral triangle are 60° each.

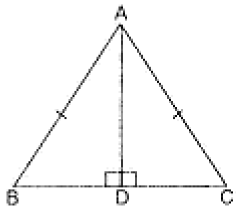
Ans. : Let ABC is an equilateral triangle. We know that all the sides of an equilateral triangle are equal.
$\therefore$ AB = BC = CA ....(1)



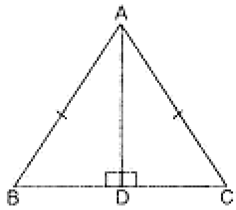
To prove :- $\angle A = \angle B = \angle C = 60^\circ$
Proof :-
In ΔABC we have:-

AB = AC [from (1)]
$\Rightarrow \angle C = \angle B$ ....(2)
[∵ Angles opposite to equal sides of a triangle are equal]
Again from (1),
BC = AC
$\Rightarrow \angle A = \angle B$ .....(3)
[∵ Angles opposite to equal sides of a triangle are equal] .
From (2) & (3) ;
$\Rightarrow \angle A = \angle B = \angle C$ ....(4)
Now,
$\angle A + \angle B + \angle C = 180^\circ$ [∵ Angle sum property of a triangle]
$\Rightarrow \angle A + \angle A + \angle A = 180^\circ$ [From (4)]
$\Rightarrow 3\angle A = 180^\circ$ |
$\Rightarrow \angle A = \frac{180^\circ}{3} = 60^\circ$
$\therefore \angle A = \angle B = \angle C = 60^\circ$ [from (4)].
Hence, each angle of an equilateral triangle is equal to 60°.

19. AD is an altitude of an isosceles triangle ABC in which AB = AC. Show that
    i. AD bisects BC
    ii. AD bisects ∠A.



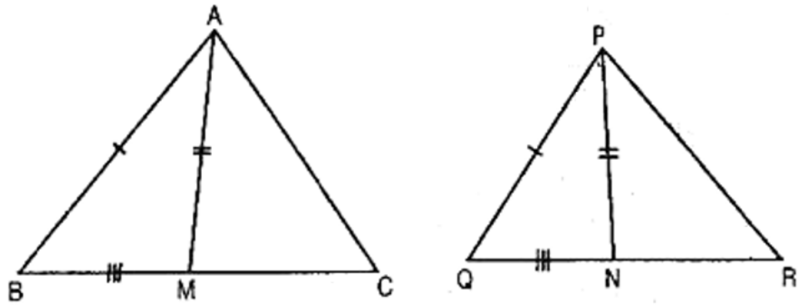
Ans. :



Given : AD is an altitude of an isosceles triangle ABC in which AB = AC
To prove :
i. AD bisects BC
ii. AD bisects ∠A
Proof :
i. In right △ADB and right △ADC,
AB = AC . . . . [Given]
Side AD = Side AD . . . . [Common]
∴ △ADB ≅ △ADC . . . [RHS Rule]
∴ BD = CD . . . [c.p.c.t.]
∴ AD bisects BC.
ii. △ADB ≅ △ADC . . . [As proved above]
∴ ∠BAD = ∠CDA . . . [c.p.c.t.]
∴ AD bisects ∠A

20. Two sides AB and BC and median AM of the triangle ABC are respectively equal to side PQ and QR and median PN of PQR (See figure). Show that:
    i. $\triangle ABM \cong \triangle PQN$

ii. $\triangle ABC \cong \triangle PQR$



Ans. : AM is the median of $\triangle$ABC.

$\therefore$ BM = MC = $\frac{1}{2}$ BC ...(i)

PN is the median of $\triangle$PQR.

$\therefore$ QN = NR = $\frac{1}{2}$ QR ...(ii)

Now BC = QR [Given] $\Rightarrow \frac{1}{2}BC = \frac{1}{2}QR$

$\therefore$ BM = QN ...(iii)

i. Now in $\triangle$ABM and $\triangle$PQN,
AB = PQ[Given]
AM = PN[Given]
BM = QN[From eq.(iii)]
$\therefore$ $\triangle$ABM $\cong$ $\triangle$PQN [By SSS congruency]
$\Rightarrow$ $\angle$B = $\angle$Q [By C.P.C.T.] ...(iv)

ii. In $\triangle$ABC and $\triangle$PQR,
AB = PQ [Given]
$\angle$B = $\angle$Q [Prove above]
$\therefore$ PR = QR [Given]
ABC $\cong$ PQR [By SAS congruency]

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