CHAPTER

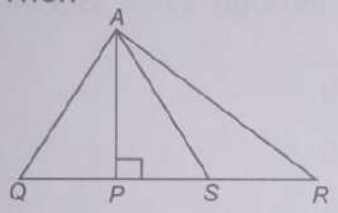
7

TRIANGLES

MATHEMATICAL REASONING

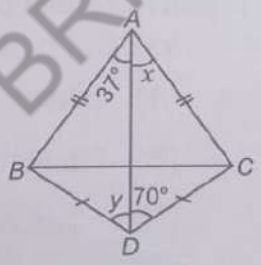
1. If $\Delta ABC \cong \Delta PQR$, then which of the following is true?
   (A) $AB = PR, BC = QR, AC = PQ$
   (B) $AB = PQ, BC = QR, AC = PR$
   (C) $AB = PR, AC = PQ, BC = PR$
   (D) None of these

2. In the given figure, $AP \perp QR$, $PR > PQ$ and $PS = PQ$. Then

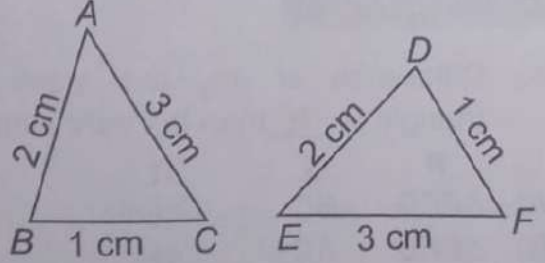


   (A) $AP = QP$ (B) $AP > AQ$
   (C) $\angle APS > \angle APQ$ (D) $AR > AQ$

3. In the given figure, x and y are _____.
   (A) $x = 70°, y = 37°$
   (B) $x = 37°, y = 70°$
   (C) $x + y = 117°$
   (D) $x - y = 100°$

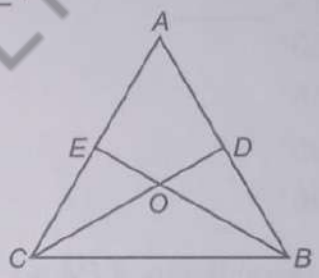


4. If the given triangles are congruent, then which of the following options is CORRECT?



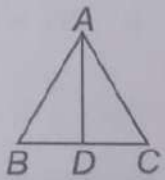
   (A) $\Delta ABC \cong \Delta DEF$
   (B) $\Delta ABC \cong \Delta EDF$
   (C) $\Delta ABC \cong \Delta FDE$
   (D) $\Delta ACB \cong \Delta EDF$

5. In the given figure, if $AE = AD$ and $BD = CE$, then _____.



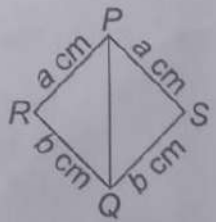
   (A) $\Delta BEC \cong \Delta BDC$
   (B) $\Delta AEB \cong \Delta ADC$
   (C) $BC = CD$
   (D) None of these

6. In the given figure, AD is the bisector of $\angle A$ and $AB = AC$. Then ΔACD and ΔABD are congruent by which criterion ?



   (A) AAA
   (B) SAS
   (C) SSA
   (D) Both (B) and (C)

7. The congruence property, by which the two triangles in the given figure are congruent is _____.
   (A) RHS
   (B) ASA
   (C) SSS
   (D) SAS



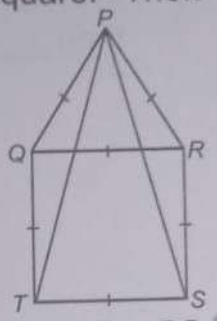
8. In ΔDEF and ΔPQR, $DE = DF$, $\angle F = \angle P$ and $\angle E = \angle Q$. The two triangles are

(A) Isosceles but not necessarily congruent
(B) Isosceles and congruent
(C) Congruent but not isosceles
(D) Neither congruent nor isosceles

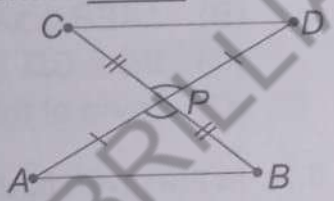
9. In ΔABC, $\angle A = 85°$, $\angle B = 30°$ and $\angle C = 65°$ then
(A) $AB > AC$ (B) $AB < AC$
(C) $BC < AC$ (D) None of these

10. AD, BE and CF, the altitude of ΔABC are equal. Then
(A) $AC = BC$ (B) $AD = AB$
(C) $AB = CF$ (D) None of these

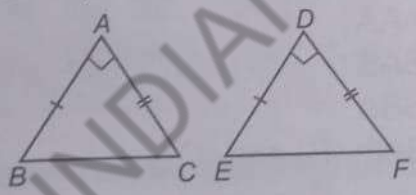
11. In the given figure, PQR is an equilateral triangle and $QRST$ is a square. Then $\angle PSR =$ _____.
(A) 30°
(B) 15°
(C) 90°
(D) 60°



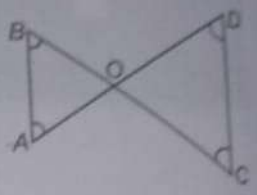
12. In the given figure, if $PA = PD$ and $PB = PC$. Then ΔPAB is congruent to _____.
(A) ΔPDC
(B) ΔPCD
(C) ΔCPD
(D) ΔDPC



13. If $AB = DE$, $AC = DF$, $\angle A = \angle D = 90°$ and $BC = 5$ cm, then EF is equal to _____.
(A) 5 cm
(B) 4.5 cm
(C) 5.5 cm
(D) Can't be determined

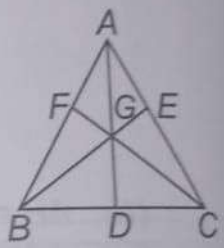


14. In figure, $\angle B < \angle A$ and $\angle C < \angle D$ then
(A) $AD < BC$
(B) $OD > OC$
(C) $OB < OA$
(D) None of these

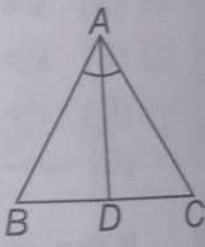


15. Which of the following is not a critertion for congruence of triangles?
(A) SAS
(B) ASA
(C) SSA
(D) SSS

16. In ΔABC, the medians AD, BE and CF pass through G. If $BG = 6$, then BE is _____.
(A) 9
(B) 6
(C) 3
(D) 1



17. If AD is bisector of $\angle A$ and D is perpendicular to BC. Then ΔABC is _____ triangle.
(A) Isosceles
(B) Equilateral
(C) Scalene
(D) None of these



ACHIEVERS SECTION (HOTS)

18. Fill in the blanks.

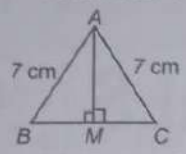
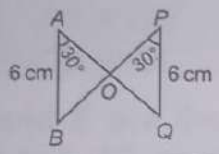
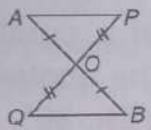
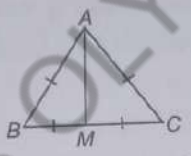
(i) In right triangles ΔABC and ΔDEF, if hypotenuse $AB = EF$ and side $AC = DE$, then $\Delta ABC \cong$ **P**.

(ii) If ΔABC is obtuse angled at point B, then the longest side is **Q**.

(iii) Difference of any two sides of triangle is **R** than the third side.

	P	Q	R
(A)	ΔEFD	BC	Greater
(B)	ΔEFD	AC	Less
(C)	ΔDEF	AB	Less
(D)	ΔDEF	AC	Greater

19. Match the following.

Column-I	Column-II
P.  $\Delta AMB \cong \Delta AMC$ by	1. SAS Rule
Q.  $\Delta AOB \cong \Delta POQ$ by	2. RHS Rule
R.  $\Delta AOP \cong \Delta BOQ$ by	3. SSS Rule
S.  $\Delta AMB \cong \Delta AMC$ by	4. AAS Rule

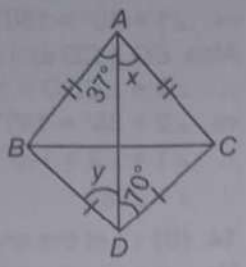
	P	Q	R	S
(A)	2	4	1	3
(B)	4	2	1	3
(C)	1	2	4	3
(D)	2	1	3	4

20. ABC is a right triangle such that $AB = AC$ and bisector of angle C intersects the side AB at D. Then $AC + AD =$ _____.

(A) BC (B) $2BC$

(C) $3BC$ (D) None of these

3. (B) : In ΔABD and ΔACD



$AB = AC$ [Given]
$BD = CD$ [Given]
$AD = AD$ [Common]
$\Rightarrow \Delta ABD \cong \Delta ACD$
[By SSS Rule]
$\Rightarrow \angle BDA = \angle CDA$ (By C.P.C.T)
$\Rightarrow y = 70°$
Similarly, $x = 37°$

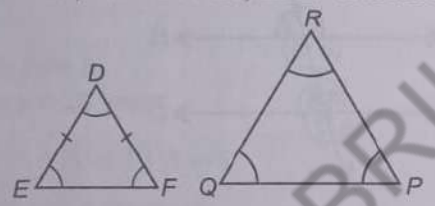
4. (B)

5. (B) : We have, $AE = AD$ and $CE = BD$
$\Rightarrow AE + CE = AD + BD$
$\Rightarrow AC = AB$ ...(i)
Now, in ΔAEB and ΔADC, we have
$AE = AD$ [Given]
$\angle EAB = \angle DAC$ [Common]
$AB = AC$ [From (i)]
$\therefore \Delta AEB \cong \Delta ADC.$ [By SAS Congruency]

6. (B) : In ΔACD and ΔABD
$AB = AC$ (Given)
$\angle BAD = \angle CAD = \frac{1}{2}\angle A$ ($\because$ AD bisects $\angle A$)
$AD = AD$ (Common)
$\therefore \Delta ACD \cong \Delta ABD$ (By SAS congruency)

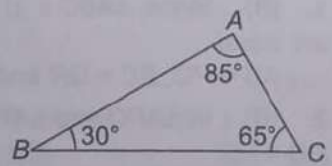
7. (C) : In ΔPQR and ΔPQS
$PR = PS = a$ cm
$RQ = QS = b$ cm
$PQ = PQ$ (Common)
$\therefore \Delta PQR \cong \Delta PQS$ (By SSS congruency)

8. (A) : In ΔDEF, $DE = DF$. So, ΔDEF is isosceles.

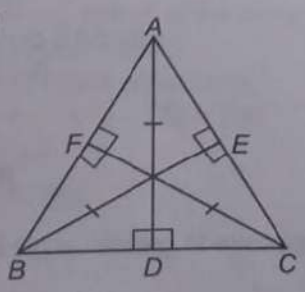


$\therefore \angle F = \angle E$ ... (i)
Also, $\angle F = \angle P$ and $\angle E = \angle Q$ ... (ii)
From (i) and (ii), we get $\angle P = \angle Q$
Now, in ΔPQR, $\angle P = \angle Q \Rightarrow RQ = PR$
So, ΔPQR is isosceles.
Hence, ΔDEF and ΔPQR are isosceles but not necessarily congruent.

9. (A) : In any triangle the side opposite to the greater angle is longer.
Since, $\angle C > \angle B$
$\Rightarrow AB > AC$ and $\angle B < \angle A$
$\Rightarrow AC < BC$



10. (A) :



In right triangles BCE and CBF,
$BC = CB$ [Common]
$BE = CF$ [Given]
$\angle BEC = \angle CFB$ [Each 90°]
$\therefore \Delta BCE \cong \Delta CBF$ [By R.H.S. congruency]
$\Rightarrow \angle CBE = \angle BCF$ [By C.P.C.T.]
and $\angle ABC = \angle ACB$
$\Rightarrow AC = AB$ [Sides opposite to equal angles of a Δ are equal]

Similarly, $\Delta ABD \cong \Delta BAE$
$\Rightarrow \angle ABC = \angle BAC$ [By C.P.C.T.]
$\Rightarrow AC = BC$
[Sides opposite to equal angles of a Δ are equal]

11. (B) : $\angle PRS = (90° + 60°) = 150°$
$RQ = PR$ ... (i) [Sides of equilateral Δ]
and $RQ = RS$ ... (ii) [Sides of square]
$\therefore RP = RS$ [from (i) and (ii)]
$\Rightarrow \angle RPS = \angle RSP = x$
In ΔPSR, $\angle PRS + \angle SPR + \angle RSP = 180°$
$\Rightarrow 150° + x + x = 180° \Rightarrow 2x = 30° \Rightarrow x = 15°$

12. (A) : In ΔPDC and ΔPAB.
$\angle CPD = \angle BPA$ (vertically opposite angles)
$CP = BP$ (given)
$PD = PA$ (given)
$\therefore \Delta PDC \cong \Delta PAB$ (SAS congruency)

13. (A) : In ΔABC and ΔDEF
$AB = DE$ (given)
$\angle A = \angle B = 90°$
$AC = DF$ (given)
$\Delta ABC \cong \Delta DEF$ (SAS congruency)
$\therefore EF = BC = 5$ cm (By C.P.C.T.)

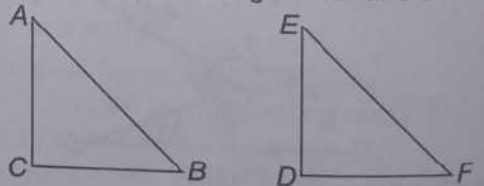
14. (A) : Since $\angle B < \angle A$ and $\angle C < \angle D$, then
$BO > AO$ and $OC > OD$
[$\because$ sides opposite to smaller angle is smaller]
$\therefore BO + OC > AO + OD \Rightarrow BC > AD$

15. (C)

16. (A) : We know that the centroid divides the median in the ratio 2 : 1.
$\therefore BE = \frac{3}{2}BG = \frac{3}{2}(6) = 9$

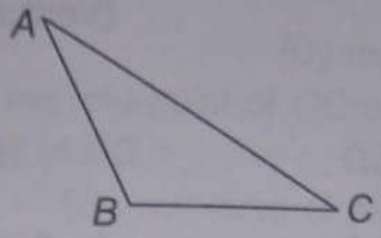
17. (A) : In ΔADB and ΔADC
$\angle BAD = \angle CAD$ ($\because$ AD bisects $\angle A$)
$\angle ADB = \angle ADC$ ($\because$ Each 90°)
$AD = AD$ (common)
$\Delta ADB \cong \Delta ADC$ (ASA congruency)
$\therefore AB = AC$ (by CPCT)
$\therefore \Delta ABC$ is an isosceles triangle.

18. (B) : (i) In right angled triangle ACB and DEF.



$AB = EF$ (given)
$AC = DE$ (given)
$\therefore \Delta ABC \cong \Delta EFD$ (RHS congruency)

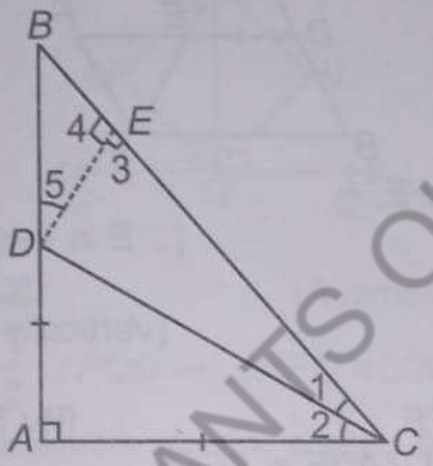
(ii) Obtuse angle is the greatest angle.
$\therefore$ Side opposite to $\angle B$ *i.e.*, AC



(iii) Difference of any two sides of a triangle is less than the third side.

19. (A)

20. (A) : Given a right angled ΔABC, where $AB = AC$ and CD is the bisector of $\angle C$.



Let us draw $DE \perp BC$.
In right angled ΔABC, $AB = AC$, and $\angle A = 90°$
Now, in ΔDAC and ΔDEC,
$\angle A = \angle 3$ [Each 90°]
$\angle 2 = \angle 1$ [$\because$ CD is the bisector of $\angle C$]
$DC = DC$ [Common]
$\therefore$ $\Delta DAC \cong \Delta DEC$ [By AAS congruency]
$\Rightarrow$ $DA = DE$ ...(1)
and $AC = EC$ [By C.P.C.T.] ...(2)
Also, in ΔABC, $AB = AC \Rightarrow \angle C = \angle B$ ...(3)
[Angles opposite to equal sides are equal]
Again, in ΔABC, $\angle A + \angle B + \angle C = 180°$
[by angle sum property of triangle]
$\Rightarrow$ $90° + \angle B + \angle B = 180°$ [From (3)]
$\Rightarrow$ $2\angle B = 90° \Rightarrow \angle B = 45°$
In ΔBED, $\angle 5 = 180° - (\angle B + \angle 4)$
$\therefore$ $\angle 5 = 180° - (45° + 90°) = 180° - 135° = 45°$
$\angle B = \angle 5 \Rightarrow DE = BE$ ...(4)
[Sides opposite to equal angles are equal]
From (1) and (4),
$DA = DE = BE$ ...(5)
$\because$ $BC = EC + BE = AC + AD$ [from (2) and (5)]
Thus, $AD + AC = BC$