# Downloaded from www.studiestoday.com <br> 7. Triangles 

Q 1 In figure, $\mathrm{OA}=\mathrm{OB}$ and $\mathrm{OD}=\mathrm{OC}$.


Show that
(i) $\Delta_{\mathrm{AOD}} \cong \Delta_{\mathrm{BOC}}$
(ii) $\mathrm{AD} \| \mathrm{BC}$.

Marks (2)
Q 2 ABC is a triangle in which altitudes BE and CF to sides AC and AB are equal. Show that
(i) $\Delta_{\mathrm{ABE}} \cong \Delta_{\mathrm{ACF}}$
(ii) $\mathrm{AB}=\mathrm{AC}$, i.e. ABC is an isosceles triangle.


Marks (2)
Q $3 A D$ and $B C$ are equal perpendiculars to a line segment $A B$. Show that $C D$ bisects $A B$.


Marks (2)

Q 4 Triangle $A B C$ is an isosceles triangle; $C D$ is bisector to the base $A B$. Prove that the altitude, the bisector and the median to the base of triangle $A B C$ match.


Marks (2)
Q5

## Triangle $A B C$ is congruent to $A_{1} B_{1} C_{1} \cdot M$ and $M_{1}$ are the points on sides $A B$ and $A_{1} B_{1}$ such that $A M=A_{1} M_{1}$. Prove that $\mathrm{CM}=\mathrm{C}_{1} \mathrm{M}_{1}$ and $\angle \mathrm{BMC}=\angle \mathrm{B}_{1} \mathrm{M}_{1} \mathrm{C}_{1}$.



Marks (2)
Q $6 A B C D$ is a parallelogram and $B E F C$ is a square. Show that triangles $A B E$ and $D C F$ are congruent.

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Marks (2)
Q $7 P Q R$ and $Q S T$ are two triangles such that
$\angle_{4}=\angle_{6}$
$\angle 1=\angle 3$
$\angle 4=\angle 5$
Prove that $\angle_{R}=\angle_{T}$


Marks (2)
Q 8 BD is a line segment. From $D$ two line segments $A D$ and $D C$ are drawn
such that $A D=C D$, also $\angle_{3}=L_{4}$. Prove that segment $B D$ bisects
$\angle{ }_{A B C}$.


Q 9 D is a point on side BC of $\triangle_{\mathrm{ABC}}$ such that $\mathrm{AD}=\mathrm{AC}$. Show that
$A B>A D$.


Marks (3)

Q 10 P is a point equidistant from two lines 1 and m intersecting at point A .
Show that the line AP bisects the angle between them.


Marks (3)
Q 11 In an isosceles triangle $A B C$ with $A B=A C, D$ and $E$ are points on $B C$ such that $B E=C D$. Show that $A D=A E$.


Marks (3)

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Q 12 In $\triangle_{\mathrm{ABC}}$, the bisector AD of $\angle_{\mathrm{A}}$ is perpendicular to side BC . Show that $\mathrm{AB}=\mathrm{AC}$.


Marks (3)
Q 13 AB is a line segment and P is its mid-point. D and E are points on the same side of AB such that $L_{\mathrm{BAD}}=L_{\mathrm{ABE}}$ and $\angle_{\mathrm{EPA}}=L_{\mathrm{DPB}}$. Show that
(i) $\triangle_{\text {DAP }} \cong \Delta_{\text {EBP }}$
(ii) $\mathrm{AD}=\mathrm{BE}$


Marks (3)
Q 14 In figure, $\mathrm{AC}=\mathrm{AE}, \mathrm{AB}=\mathrm{AD}$ and $\angle \mathrm{BAD}=\angle_{\mathrm{EAC}}$. Show that $\mathrm{BC}=\mathrm{DE}$.


Marks (3)
Q 15 Angles opposite to equal sides of an isosceles triangle are equal.
Marks (3)

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Q 16 ABC and DBC are two isosceles triangles on the same base BC . Show that $L_{\mathrm{ABD}}=\angle_{\mathrm{ACD}}$.


## Marks (3)

Q $17 \triangle_{\text {ABC and }} \triangle_{\text {DBC }}$ are two isosceles triangles on the same base BC and vertices A and D are on the same side of BC . If AD is extended to intersect BC at P , show that
(i) $\Delta_{\mathrm{ABD}} \xlongequal{\rightleftharpoons} \Delta_{\mathrm{ACD}}$
(ii) $\Delta_{\mathrm{ABP}} \cong \Delta_{\mathrm{ACP}}$


Marks (3)
Q 18 AB is a line-segment. P and Q are points on opposite sides of AB such that each of them is equidistant from the points A and B . Show that the line PQ is the perpendicular bisector of AB .

Marks (4)
Q 19 If D is the mid-point of the hypotenuse AC of a right triangle ABC , prove that $\mathrm{BD}=(1 / 2) \mathrm{AC}$.


Marks (4)

Q $20 \triangle_{\mathrm{ABC}}$ is an isosceles triangle in which $\mathrm{AB}=\mathrm{AC}$. Side BA is produced to D such that $\mathrm{AD}=\mathrm{AB}$. Show that $\angle \mathrm{BCD}$ is a right angle.


Marks (4)
Q 21 Prove that the perimeter of a triangle is greater than the sum of its altitudes.

Marks (4)
Q 22 In Figure, $\mathrm{PR}>\mathrm{PQ}$ and PS bisects $\angle \mathrm{QPR}$. Prove that $\angle \mathrm{PSR}>\angle \mathrm{PSQ}$.


Marks (4)
Q 23 In figure, the side QR of $\triangle_{\mathrm{PQR}}$ is produced to a point S . If the bisectors of $L_{\mathrm{PQR}}$ and $L_{\mathrm{PRS}}$ meet at point T , then prove that $\angle \mathrm{QTR}=(1 / 2) \angle \mathrm{QPR}$.


Marks (4)

Q 24 In Figure, $\angle_{\mathrm{B}}<\angle_{\mathrm{A}}$ and $\angle_{\mathrm{C}}<L_{\mathrm{D}}$. Show that $\mathrm{D}<\mathrm{BC}$.


Most Important Questions

Q 1 In the given figure ABCD is a quadrilateral in which $\mathrm{AD}=\mathrm{BC}$ and $\angle \mathrm{DBA}=\angle \mathrm{CBA}$ Prove that
(i) $\Delta_{A B D} \cong \Delta_{\text {BAC }}$

(ii) $\mathrm{BD}=\mathrm{AC}$
(iii) $\angle_{\mathrm{ABD}}=\angle \mathrm{BAC}$

Q 2 Line segment $A B$ is parallel to another line segment $C D$. $O$ is the mid-point of $A D$. Show that
(i) $\Delta_{\mathrm{AOB}} \cong \Delta_{\text {DOC (ii) } \mathrm{O} \text { is also the mid-point of BC. }}$


Q 3 In the given figure it is given that $L_{\mathrm{A}}=L_{\mathrm{C}}$ and $\mathrm{AB}=\mathrm{BC}$. Prove that $\triangle_{\mathrm{ABD}} \cong \triangle_{\mathrm{CBE}}$.


Q 4 In $\triangle_{\mathrm{ABC}}, \mathrm{AB}=\mathrm{AC}$, and the bisectors of angles B and C intersect at point O . Prove that $\mathrm{BO}=\mathrm{CO}$ and the ray AO is the bisector
of angle BAC.


Q $5 \triangle_{\mathrm{ABC}}$ and $\triangle_{\mathrm{DBC}}$ are two triangles on the same base BC such that $\mathrm{AB}=\mathrm{AC}$ and $\mathrm{DB}=\mathrm{DC}$. Prove that $\angle_{\mathrm{ABD}}=\angle_{\mathrm{ACD}}$.


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Q 6 Line 1 is the bisector of an angle $\angle \mathrm{A}$ and B is any point on 1. BP and BQ are perpendiculars from B to the arms of $\angle$ A. Show that
${ }_{\text {(i) }} \Delta_{\mathrm{APB}} \cong \Delta_{\mathrm{AQB}}$
(ii) $\mathrm{BP}=\mathrm{BQ}$ or B is equidistant from the arms of $\angle \mathrm{A}$.


Q 7 P is a point on the bisector of $A B C$. If the line through $P$ parallel to $A B$ meets $B C$ at $Q$, prove that the triangle $B P Q$ is isosceles.


Q 8 In two right triangles one side and an acute angle of one are equal to the corresponding side and angle of the other. Prove that the triangles are congruent.
Q 9 AD and $B E$ are respectively altitudes of an isosceles triangle $A B C$ with $A C=B C$. Prove that $A E=B D$.


Q 10 If the bisector of the exterior vertical angle of a triangle is parallel to the base. Show that the triangle is isosceles.
Q 11 If $E$ and $F$ are respectively the midpoints of equal sides $A B$ and $A C$ of a triangle $A B C$, Show that $B F=C E$.
$Q 12$ In an isosceles triangle $A B C$ with $A B=A C, D$ and $E$ are points on $B C$ such that $B E=C D$, show that $A D=A E$.
Q 13 ABC and DBC are two isosceles triangles on the same base BC . Show that $L_{\mathrm{ABD}}=\angle_{\mathrm{ACD}}$.

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Q 15 ABC is an isosceles triangle with $\mathrm{AB}=\mathrm{AC}$. Show that $L_{\mathrm{B}}=L_{\mathrm{C}}$.
Q 16 If BE and CF are equal altitudes of a triangle ABC . Prove that triangle ABC is isosceles.
Q 17 AD is the altitude of an isosceles triangle in which $\mathrm{AB}=\mathrm{AC}$. Show that
(i) AD bisects BC
(ii) AD bisects $\angle$ A.

Q 18 In the given figure $\mathrm{QPR}=\mathrm{PQR}$ and M and N are respectively on sides QR and PR of PQR such that $\mathrm{QM}=\mathrm{PN}$. Prove that $\mathrm{OP}=$ OQ , were O is the point of intersection of PM and QN .


Q 19 Fill in the blanks:
(i) Sides opposite to equal angles of a triangle are ......
(ii) In an equilateral triangle all angles are ...... and of ...... degree.
(iii)In right triangles ABC and DEF , if hypotenuse $\mathrm{AB}=\mathrm{EF}$ and $\mathrm{AC}=\mathrm{DE}$, then $\triangle_{\mathrm{ABC}} \cong \triangle$.
(iv)If altitudes CE and BF of a triangle ABC are equal, then $\mathrm{AB}=\ldots$
(v)In triangle ABC if $\mathrm{A}=\mathrm{C}$ then $\mathrm{AB}=\ldots$

Q 20 State true or False

If the altitude from one vertex of a triangle bisects the opposite side, then the triangle may be isosceles.

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The bisectors of two equal angles of a triangle are equal.
(iii)

If the bisector of the vertical angle of a triangle bisects the base, then the triangle may be isosceles.
(iv)

The two altitudes corresponding to two equal sides of a triangle need not be equal.
(v)

Two right triangles are congruent if hypotenuse and a side of the triangle are respectively equal to the hypotenuse and the side of the other triangle.

Q 21 Show that in a right angled triangle, the hypotenuse is the longest side.
Q 22 Prove that any two sides of a triangle are together greater than twice the median drawn to the third side.


Q 23 In the given figure $P Q R$ is a triangle and $S$ is any point in its interior, show that $S Q+S R<P Q+P R$.


Q 24 Prove that the perimeter of a triangle is greater than the sum of the three medians.

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Q 25 In the given figure $\angle_{\mathrm{E}}>\angle_{\mathrm{A} \text { and }} \angle_{\mathrm{C}}>\angle_{\mathrm{D}}$. Prove that $\mathrm{AD}>\mathrm{EC}$.


Q 26 In the given figure T is a point on the side QR of $\triangle_{\mathrm{PQR}}$ and S is a point such that $\mathrm{RT}=\mathrm{ST}$. Prove that $\mathrm{PQ}+\mathrm{PR}>\mathrm{QS}$.


Q 27 Of all the line segments drawn from a point P to a line m not containing P , let PD be the shortest. If B and C are points on m such that D is the mid-point of BC , prove that $\mathrm{PB}=\mathrm{PC}$.


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Q 28 In the given figure $A C>A B$ and $D$ is the point on $A C$ such that $A B=A D$. Prove that $B C>C D$.


Q 29 In the given figure prove that $C D+D A+A B+B C>2 A C$


Q 30 Fill in the blanks:
(i) In a right triangle the hypotenuse is the... side.
(ii) The sum of three altitudes of a triangle is... than its perimeter.
(iii) The sum of any two sides is ...... than the third side.
(iv) If two sides of a triangle are unequal, then the larger side has ..... angle opposite to it.
(v) If two angles of a triangle are unequal, then the smaller angle has the ..... side opposite to it.

