

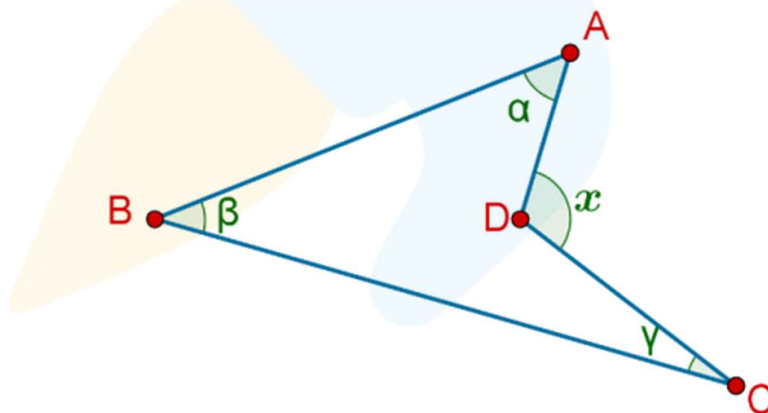
Triangles and Quadrilaterals

Review Exercise Questions

Level-1

Single Choice Correct Only

- Q1.** In $\triangle ABC$, BC is the greatest side. Then,
- (A) $\angle A$ must be greater than 60°
 - (B) $\angle A$ must be greater than 75° but less than 90°
 - (C) $\angle A$ must be greater than 45° but not necessarily greater than 60°
 - (D) none of these
- Q2.** In $\triangle ABC$, $\angle B = 35^\circ$, $\angle C = 65^\circ$ and the bisector AD of $\angle BAC$ meets BC at D . Then, which of the following is true?
- (A) $AD > BD > CD$
 - (B) $BD > AD > CD$
 - (C) $AD > CD > BD$
 - (D) None of these
- Q3.** Consider the following figure:



Which of the following is correct?

- (A) $x = 2\alpha + \beta + 2\gamma$
- (B) $x = \alpha + \beta + \gamma$
- (C) $2x = \alpha + \beta + \gamma$
- (D) None of these

- Q4.** If the altitudes from two vertices of a triangle to the opposite sides are equal, then the triangle
- (A) is equilateral
 - (B) is isosceles, but not necessarily equilateral
 - (C) could be any scalene triangle
 - (D) must be right-angled
- Q5.** In a parallelogram ABCD, suppose that the diagonal AC bisects $\angle A$. Then, we can say that ABCD is a
- (A) square
 - (B) rectangle, but not necessarily a square
 - (C) rhombus
 - (D) not necessarily any of these
- Q6.** The bisectors of the angles in a parallelogram will form
- (A) a rectangle
 - (B) a square
 - (C) a rhombus
 - (D) not necessarily any of these
- Q7.** Suppose that X is any point on side BC of $\triangle ABC$. Which of the following statements is true?
- (A) Both AB and AC must be greater than AX
 - (B) At least one of AB or AC is greater than AX
 - (C) Exactly one of AB or AC is greater than AX
 - (D) Both AB and AC can be smaller than AX
- Q8.** In $\triangle ABC$, the internal bisectors of $\angle B$ and $\angle C$ meet at I. Then,
- (A) $\angle BIC = 90^\circ + \angle A$
 - (B) $\angle BIC = 90^\circ - \angle A$
 - (C) $\angle BIC = 90^\circ + \frac{1}{2}\angle A$
 - (D) $\angle BIC = 90^\circ - \frac{1}{2}\angle A$
 - (E) none of these
- Q9.** In $\triangle ABC$, the external bisectors of $\angle B$ and $\angle C$ meet at X. Then,
- (A) $\angle BXC = 90^\circ + \angle A$
 - (B) $\angle BXC = 90^\circ - \angle A$
 - (C) $\angle BXC = 90^\circ + \frac{1}{2}\angle A$
 - (D) $\angle BXC = 90^\circ - \frac{1}{2}\angle A$
 - (E) none of these

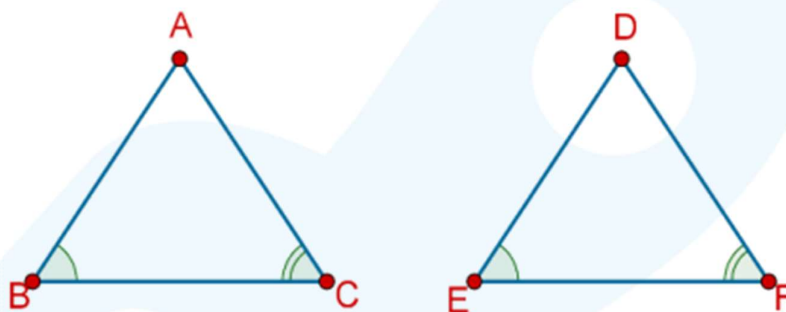
Q10. In $\triangle ABC$, perpendiculars AD and BE are drawn to BC and CA respectively to meet at the point H . Then,

- (A) $\angle AHE = \angle C$
- (B) $\angle AHE = 90^\circ - \angle C$
- (C) $\angle AHE = \frac{1}{2}\angle C$
- (D) $\angle AHE = 90^\circ - \frac{1}{2}\angle C$
- (E) none of these

Q11. In a quadrilateral, the midpoints of the sides are joined. The resulting quadrilateral

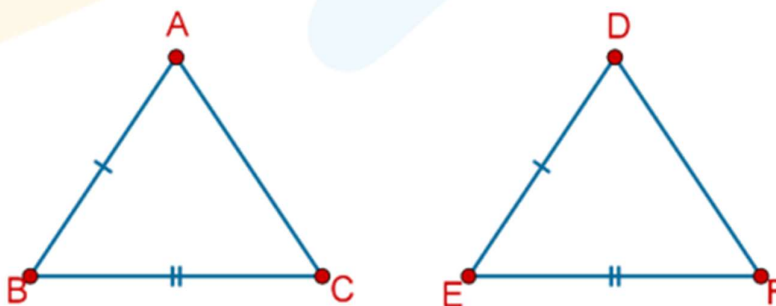
- (A) will be a parallelogram
- (B) will be a parallelogram which is a rectangle
- (C) will be a parallelogram which is a rhombus
- (D) may not necessarily be a parallelogram

Q12. In $\triangle ABC$ and $\triangle DEF$, it is given that $\angle B = \angle E$ and $\angle C = \angle F$. In order that $\triangle ABC \equiv \triangle DEF$, we must have



- (A) $AB = DF$
- (B) $AC = DE$
- (C) $BC = EF$
- (D) $\angle A = \angle D$
- (E) Any pair of sides as equal

Q13. In $\triangle ABC$ and $\triangle DEF$, it is given that $AB = DE$ and $BC = EF$. In order that $\triangle ABC \equiv \triangle DEF$, we must have:



- (A) $\angle A = \angle D$
- (B) $\angle B = \angle E$
- (C) $\angle C = \angle F$
- (D) Any of these will do

Q14. O is any point in the interior of $\triangle ABC$. Then, which of the following is true?

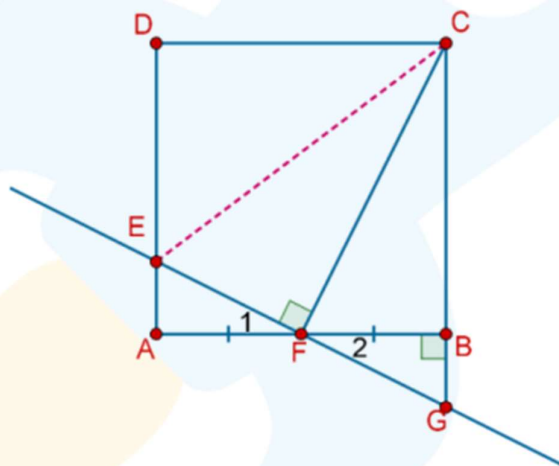
- (A) $(OA + OB + OC) > (AB + BC + CA)$
- (B) $(OA + OB + OC) > \frac{1}{2}(AB + BC + CA)$
- (C) $(OA + OB + OC) < \frac{1}{2}(AB + BC + CA)$
- (D) None of these

Multiple Options May be Correct

Q15. Which of the following statements are true?

- (A) In any triangle ABC, at the most one of the angles A, B, C can be obtuse.
- (B) In an isosceles triangle, median to the base bisects the vertical angle.
- (C) In an isosceles triangle, the median to the base is perpendicular to the base.
- (D) If two sides of a triangle are not equal, then the greater side has the greater angle opposite to it.
- (E) If two angles of a triangle are not equal, then the greater angle has the greater side opposite to it.

Q16. Consider the following figure:



ABCD is a square and F is the mid-point of AB. $EF \perp CF$ and meets CB produced at G. Then, which of the following is/are correct?

- (A) $EA = GB$
- (B) $CE = AB + AE$
- (C) $EF = GF$
- (D) $CE = CG$

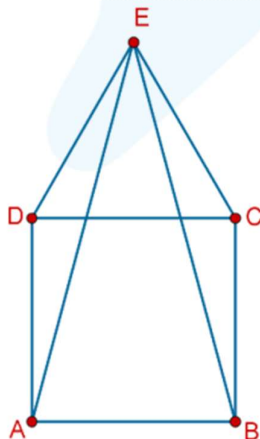
Q17. In $\triangle ABC$, AB is greater than AC, and AD is the angle bisector of $\angle A$, where D lies on BC. Which of the following are true?

- (A) $\angle B > \angle C$
- (B) $\angle C > \angle B$
- (C) $\angle ADB$ could be acute
- (D) $\angle ADC$ must be acute

- Q18.** D is the midpoint of side BC of $\triangle ABC$. Which of the following are correct?
- (A) If $AD > BD$, then $\angle A$ is acute
 - (B) If $AD > BD$, this does not necessarily imply that $\angle A$ is acute
 - (C) If $AD < BD$, then $\angle A$ is obtuse
 - (D) If $AD < BD$, this does not necessarily imply that $\angle A$ is obtuse
- Q19.** The locus of a point equidistant from
- (A) two parallel lines will be a third line parallel to the first two
 - (B) two parallel lines will be two lines not parallel to the first two
 - (C) two non-parallel lines will be a pair of perpendicular lines
 - (D) two non-parallel lines will be a line perpendicular to the one of the original two lines
- Q20.** The lengths of three sides of a triangle are represented by x, y, z . In which of the following cases can a triangle be formed?
- (A) $x = 5$ cm, $y = 3$ cm, $z = 4$ cm
 - (B) $x = 2$ cm, $y = 1$ cm, $z = 4$ cm
 - (C) $x = 9$ cm, $y = 5$ cm, $z = 2$ cm
 - (D) $x = 11$ cm, $y = 4$ cm, $z = 12$ cm
 - (E) $x = 1$ cm, $y = 1$ cm, $z = 2$ cm

Integer Answers

- Q21.** In $\triangle ABC$, $\angle B = 46^\circ$ and $\angle C = 54^\circ$. The angle between the internal bisector of the angles B and C is _____ degrees.
- Q22.** The side BC of $\triangle ABC$ is produced to D. The bisector of $\angle A$ meets BC in E. If $\angle ABC + \angle ACD = k\angle AEC$, then the value of k is _____
- Q23.** Consider the following figure:

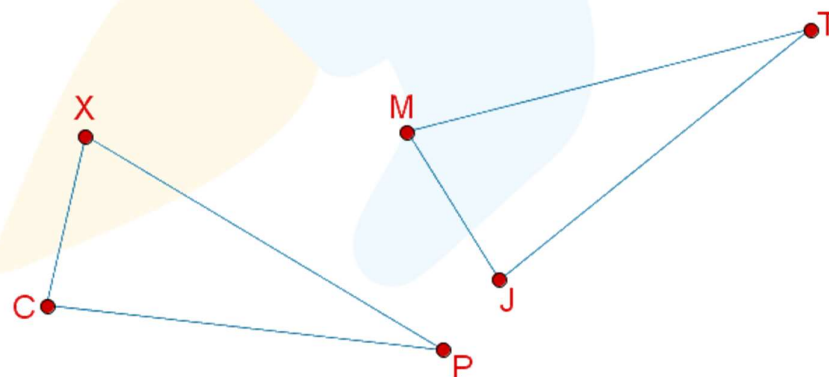


ABCD is a square and $\triangle EDC$ is an equilateral triangle. Then, $\angle EBC$ measures _____ degrees.

- Q24.** Two sides of a triangle have lengths 25 cm and 16 cm. The third side can have any value of length up to (but necessarily less than) _____ cm.
- Q25.** In an isosceles triangle, one base angle is 70° . The vertical angle must be _____ degrees.
- Q26.** In an isosceles triangle, the vertical angle is 30° . Each base angle will be equal to _____ degrees.

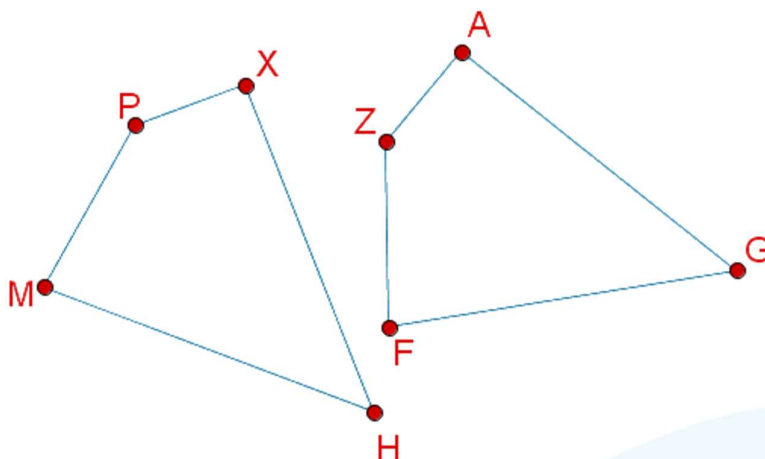
Miscellaneous

- Q28.** Consider three geometrical figures I, II and III. If $I \equiv II$ and $II \equiv III$, then I must be congruent to III. Is this true or false?
- Q29.** Two regular hexagons with sides of equal length must be congruent. Is this true or false?
- Q30.** Two figures I and II are congruent to each other. II is now flipped. I and II will no longer be congruent. Is this true or false?
- Q31.** Let N be any positive natural number greater than 100. A rectangle cannot be divided into N congruent figures for every value of N. Is this true or false?
- Q32.** The diagonals of a square divide it into four triangles of equal area. Is this true or false?
- Q33.** Two congruent figures may not have the same area. Is this true or false?
- Q34.** Consider the following figure, which shows two congruent triangles:



The congruent relation will be written as $\triangle XPC \equiv \triangle$ _____.

- Q35.** Consider the following figure, which shows two congruent quadrilaterals:

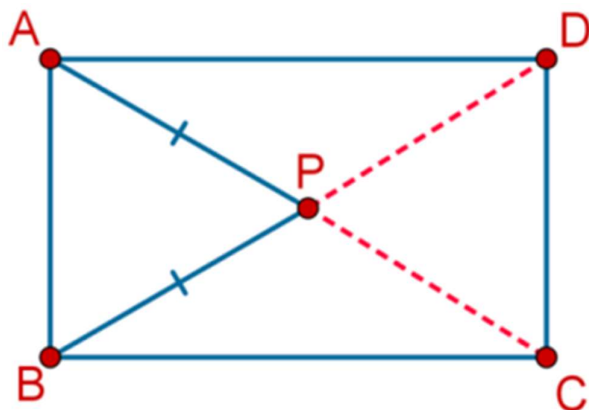


The congruent relation will be written as Quad XHMP $\equiv$ Quad _____.

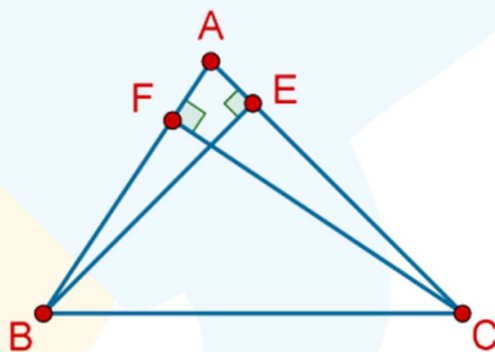
- Q36.** If a point is equidistant from two points, it must lie on the _____ bisector of the segment joining the two points.
- Q37.** In a pair of triangles, two sides and an angle of one are correspondingly equal to two sides and an angle of the other. The two triangles are congruent by the SAS criterion. Is this true or false?
- Q38.** Given a pair of sides (lengths) and a non-included angle, what is the maximum number of different triangles which can be constructed? _____
- Q39.** Given three lengths, a triangle can always be formed with its sides having these lengths. Is this true or false?
- Q40.** Given three lengths, what is the maximum number of unique triangles which can be constructed whose sides have these lengths?
- Q41.** Consider $\triangle ABC$ and $\triangle XYZ$ such that $\angle C = 90^\circ$, $\angle X = 30^\circ$, $\angle Y = 60^\circ$, $AB = XY = 10$ cm and $BC = YZ = 5$ cm. The two triangles must be congruent by the RHS criterion. Is this true or false?
- Q42.** In a quadrilateral ABCD, show that

$$AB + BC + CD + DA > 2AC$$
- Q43.** In $\triangle PQR$, if S is any point on the side QR, then show that $PQ + QR + RP > 2PS$.
- Q44.** In $\triangle PQR$, $PQ = 4$ cm and $QR = 6$ cm. What are the minimum and maximum possible lengths of side PR?
- Q45.** Prove that through any point on the bisector of an angle, if a straight line is drawn parallel to either arm of an angle, then the triangle so formed is isosceles.

- Q46.** ABCD is a rectangle. If APB is an equilateral triangle, then show that $\triangle CPD$ is also equilateral.



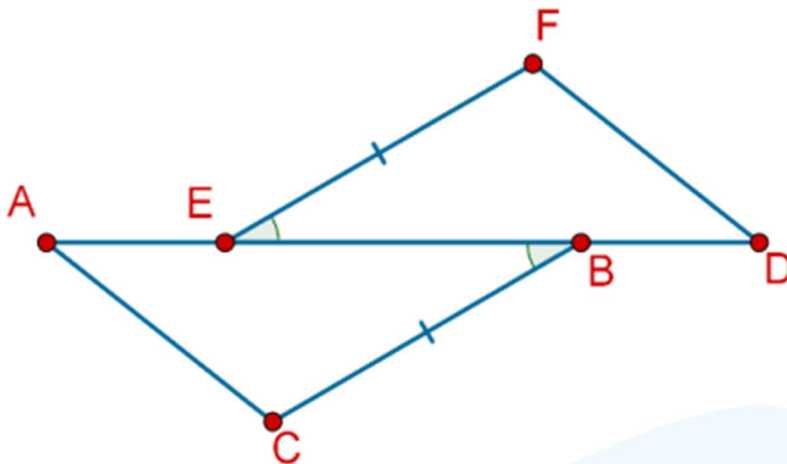
- Q47.** In a parallelogram, show that if one angle is a right angle, then all the angles are right angles.
- Q48.** In a quadrilateral ABCD, $AB \parallel CD$. If the bisectors of angles D and C meet at E, then show that $AB = AD + BC$.
- Q49.** Consider the following figure:



$BE \perp CA$ and $CF \perp BA$ such that $BE = CF$. Show that $\triangle ABE \cong \triangle ACF$.

- Q50.** Prove that if the bisector of an angle of a triangle is perpendicular to the opposite side, then the triangle must be isosceles.
- Q51.** In $\triangle ABC$, D is the mid-point of BC, $DN \perp AB$, and $DM \perp AC$. If $DN = DM$, then show that ABC is an isosceles triangle.
- Q52.** (a) If two triangles are congruent, prove that the straight lines joining the vertices to the midpoints of their bases are respectively equal.
 (b) If two triangles are congruent, the perpendiculars from the vertex to the base of each are not necessarily equal (respectively). Is this true or false?

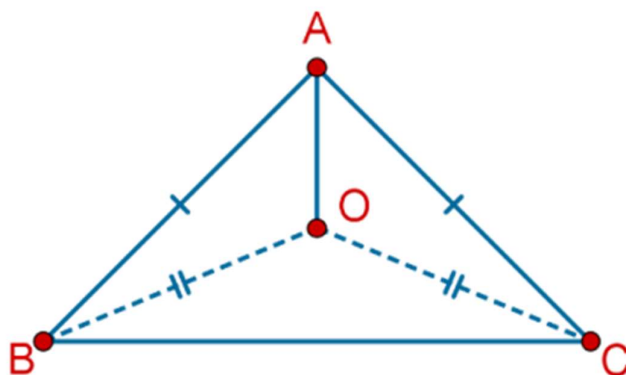
Q53. Consider the following figure:



$AE = DB$, $CB = EF$ and $\angle ABC = \angle FED$. Show that $\triangle ABC \cong \triangle FED$.

- Q54.** In a quadrilateral $ABCD$, $AD = BC$ and $\angle ADC = \angle BCD$. P is the mid-point of CD . Prove that $AP = BP$.
- Q55.** In $\triangle ABC$, suppose that $AB > AC$. Let D be a point on AB such that $AD = AC$. Express $\angle ADC$ and $\angle BCD$ in terms of $\angle B$ and $\angle C$.
- Q56.** ABC is a triangle and O is any point inside it. Then, show that $\angle BOC$ must be greater than $\angle BAC$.
- Q57.** Show that the sum of three altitudes of a triangle is greater than the sum of the three sides of the triangle.
- Q58.** In a $\triangle ABC$, the medians BE and CF are equal. Show that $AB = AC$.
- Q59.** BC is the greatest side in $\triangle ABC$. D and E are points on BC and CA respectively. BC can be smaller than DE . Is this true or false?
- Q60.** Show that the sum of any two sides of a triangle is greater than twice the median drawn to the third side.

Q61. Consider the following figure:



Show that $\angle ABO = \angle ACO$ and AO is the angle bisector of $\angle A$.

- Q62.** Two triangles ABC and DEF are such that $\angle A = \angle D$ and $\angle B = \angle E$. For the ASA congruence criterion to apply, the equal pair of sides must be the sides between these angle pairs, that is, the equal pair of sides must be AB and DE . Is this true or false?
- Q63.** Two isosceles triangles have equal bases and equal vertical angles. It is not necessary for these two triangles to be congruent. Is this true or false?
- Q64.** Any point X is taken on the side BC of $\triangle ABC$. Then, AX will always be bisected by the straight line joining the midpoints of AB and AC . Is this true or false?
- Q65.** The sides AB , BC , CD and DA of a quadrilateral are in descending order of magnitudes. Show that $\angle CDA > \angle CBA$.
- Q66.** In any quadrilateral, prove that the mid-points of the sides form the vertices of a parallelogram.
- Q67.** In $\triangle ABC$, bisectors of angles B and C meet at O . If EF is drawn parallel to BC through O , show that $EF = BE + CF$.
- Q68.** E is the mid-point of CD in parallelogram $ABCD$. Prove that
- $$\text{area}(\triangle ADE) = \frac{1}{4} \text{area}(\text{||}^{\text{gm}} \text{ABCD})$$
- Q69.** $ABCD$ is a quadrilateral and P is the mid-point of BD . Show that
- $$\text{area}(\triangle APCB) = \frac{1}{2} \text{area}(\text{ABCD})$$
- Q70.** The lengths of two sides of a triangle are given. Show that its area is the greatest when the angle between the sides is a right angle.
- Q71.** D is the mid-point of side BC of $\triangle ABC$. X is any point on AD . Prove that
- $$\text{area}(\triangle AXB) = \text{area}(\triangle AXC)$$

- Q72.** ABCD is a parallelogram and X is any point on the diagonal AC. Will $\triangle ABX$ and $\triangle ADX$ be equal in area?
- Q73.** The diagonals AC and BD of quadrilateral ABCD meet at O. It is given that $\triangle AOB$, $\triangle BOC$, $\triangle COD$ and $\triangle DOA$ have equal areas. Show that ABCD is a parallelogram.
- Q74.** In a $\triangle ABC$, D is any point on the side AC. If $AD = DC = BD$, then ABC is a right angled triangle. Is this true or false?
- Q75.** In quadrilateral ABCD, AC bisects BD. Show that AC will divide ABCD into two parts of equal area.

