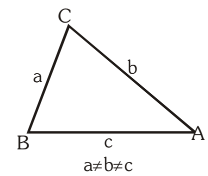
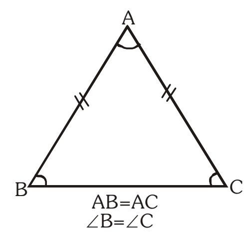
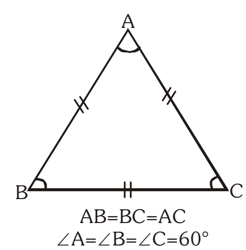
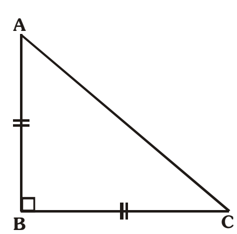
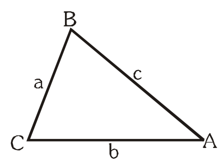
10. TRIANGLE

Triangles

Types of triangles	Definition/Property	Diagram
Scalene triangle	(i) A triangle in which none of the two sides are equal is called a scalene triangle (ii) All the three angles are also different	
Isosceles triangle	(i) A triangles in which at least two sides are equal is called an isosceles triangle. (ii) In this triangle, the angles opposite to the congruent sides are also equal (iii) 2 medians, 2 altitudes equal. (iv) Internal bisectors of 2 angles are equal. (v) Bisector of vertical angle bisects the base and perpendicular to the base. (vi) May be acute, obtuse or right angled triangle..	
Equilateral triangle	(i) A triangle in which all the three sides are equal is called an equilateral triangle. (ii) In this triangle each angle is congruent and equal to 60° (iii) Always acute angled. (iv) Incentre, circumcentre, orthocentre and centroid coincide. (v) Point of intersection of altitude, medians and angular bisectors is same.	
Isosceles right angled triangle AB = BC	(i) 2 sides are equal (ii) Angle included by the equal sides is 90°. (iii) Side opposite to 90° is hypotenuse and is the greatest side. (iv) Median to the hypotenuse is half of the hypotenuse (v) Of the two acute angles, if one is 30°. The smallest side is half of the greatest side or the side opposite to 30° is half of hypotenuse.	

■ Fundamental properties of triangles

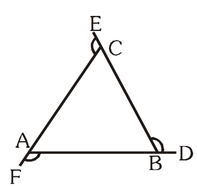
- Sum of any two sides is always greater than the third side.
- The difference of any two sides is always less than the third side.
- Greater angle has a greater side opposite to it and smaller angle has a smaller side opposite to it i.e., if two sides of triangle are not congruent then the angle opposite to the greater side is greater.
- Let a, b and c be the three sides of a ΔABC and c is the largest side, then



  - if $c^2 < a^2 + b^2$, the triangle is acute angle triangle
  - if $c^2=a^2+b^2$, the triangle is right angled triangle
  - if $c^2 > a^2+b^2$, the triangle is obtuse angle triangle

- The sum of all the three interior angles is always 180°

  i.e $\angle CAB+\angle ABC+\angle BCA=180°$



- The sum of three (ordered) exterior angles of a angles is 360°

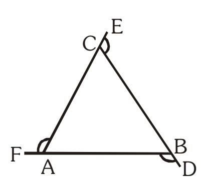


Fig.(i)

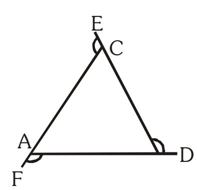


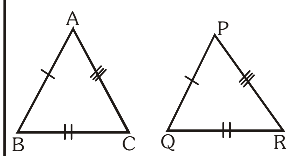
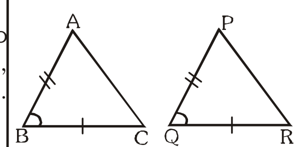
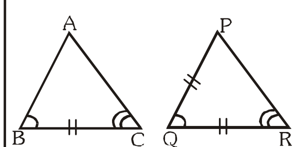
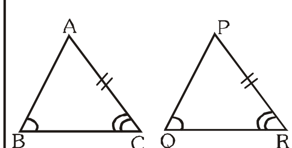
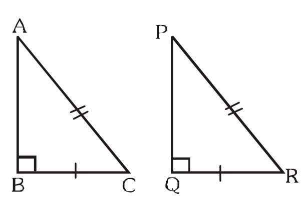
Fig.(ii)

In fig (i) : $\angle FAC+\angle ECB+\angle DBA = 360°$

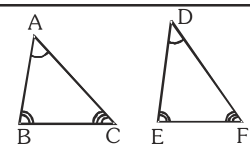
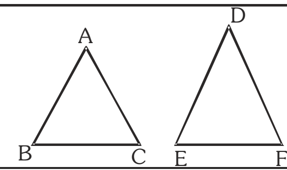
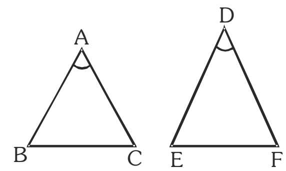
In fig (ii) : $\angle FAB+\angle DBC+\angle ECA = 360°$

- A triangle must have at least two acute angles
- In a triangle, the measure of an exterior angle equals the sum of the measures of the interior opposite angles.
- The measure of an exterior angle of a triangle is greater than the measure of each of the opposite interior angles.

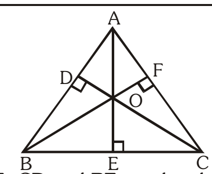
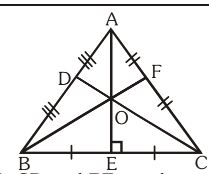
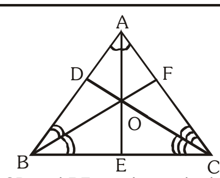
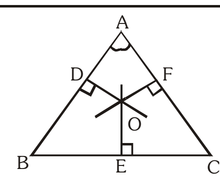
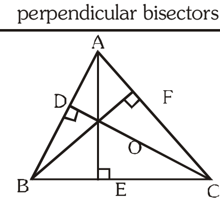
■ Congruence of triangles

Test	Property	Diagram
S – S – S	(Side–Side–Side) If the three sides of one triangle are equal to the corresponding three sides of the other triangle, then the two triangles are congruent AB ≅ PQ, AC ≅ PR, BC ≅ QR ∴ ΔABC ≅ ΔPQR	
S – A – S	(Side–Angle–Side) If two sides and the included angle between them be congruent to the corresponding sides and the angle included between them, of the other triangle then the two triangles are congruent. AB ≅ PQ, ∠ABC ≅ ∠PQR, BC ≅ QR ∴ ΔABC ≅ ΔPQR	
A – S – A	(Angle–Side–Angle) If two angles and the included side of a triangle are congruent to the corresponding angles and the included side of the other triangle, then the two triangles are congruent. ∠ABC≅∠PQR, BC≅QR, ∠ACB≅∠PRQ ∴ ΔABC≅ΔPQR	
A – A – S	(Angle–Angle–Side) If two angles and a side other than the included side of a one triangle are congruent to the corresponding angles and a corresponding side other than the included side of the other triangle, then the two triangles are congruent. ∠ABC ≅ ∠PQR, ∠ACB ≅ ∠PRQ and AC ≅ PR (or AB ≅ PQ)	
R – H – S	(Right angle-Hypotenuse-Side) If the hypotenuse and one side of the right angled triangle are congruent to the hypotenuse and a corresponding side of the other right angled triange, then the two given triangles are congruent. AC ≅ PR, ∠B = ∠Q and BC ≅ QR ∴ ΔABC ≅ ΔPQR	

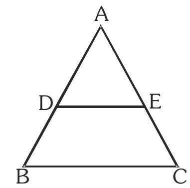
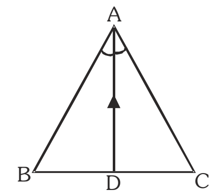
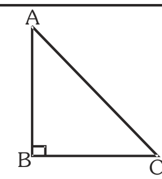
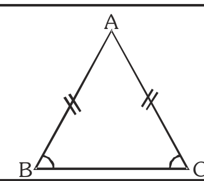
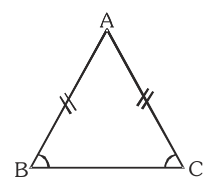
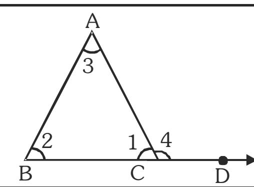
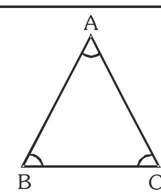
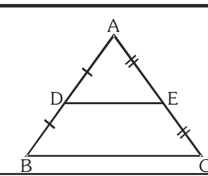
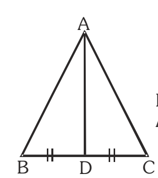
■ Theorems related to similar triangles

Test	Property	Diagram
A – A – A (similarity)	If in two triangles corresponding angles are equal i.e., the two triangles are equiangular, then the triangles are similar. $\angle A = \angle D$, $\angle B = \angle E$ & $\angle C = \angle F$ $\Delta ABC \sim \Delta DEF$	
S – S – S (Similarity)	If the corresponding sides of two triangles are proportional, then they are similar.. $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$ $\Delta ABC \sim \Delta DEF$	
S – A – S (Similarity)	If in two triangles, one pair of corresponding sides are proportional and the included angles are equal then the two triangles are similar.. $\frac{AB}{DE} = \frac{AC}{DF}$ & $\angle BAC = \angle EDF$ $\Delta ABC \sim \Delta DEF$	

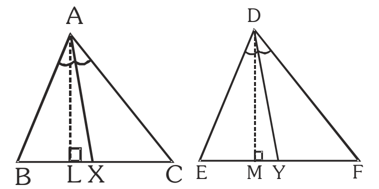
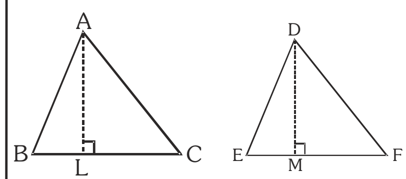
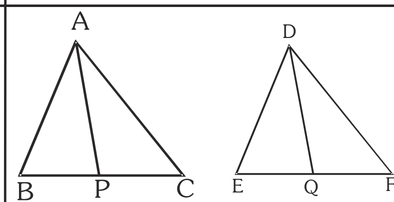
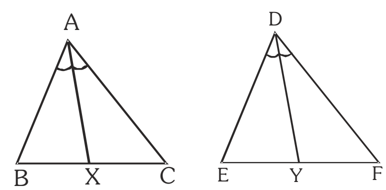
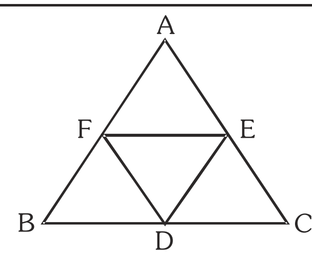
■ Important Definition

Nomenclature	Property/Definition	Diagram
Altitude (or height)	The perpendicular drawn from the opposite vertex of a side in a triangle called an altitude of the triangle. ➤ There are three altitudes in a triangle.	 AE, CD and BF are the altitudes
Median	The line segment joining the mid-point of a side to the vertex opposite to the side is called a median. ➤ There are three medians in a triangle. ➤ A median bisects the area of the triangle i.e, Ar(ABE) = Ar(AEC) = $\frac{1}{2}$ Ar(ΔABC) etc. ➤ Point of intersection is called Centroid.	 AE, CD and BF are the medians (BE=CE, AD=BD, AF=CF)
Angle bisector	A line segment which originates from a vertex and bisects the same angle is called an angle bisector ($\angle BAE = \angle CAE = \frac{1}{2} \angle BAC$) etc. ➤ Point of intersection of angle bisectors is called Incentre.	 AE, CD and BF are the angles bisectors.
Perpendicular bisector	A line segment which bisects a side perpendicularly (i.e. at right angle) is called a perpendicular bisector of a side of triangle. ➤ All points on the perpendicular bisector of a line are equidistant from the ends of the line. ➤ Point of intersection of perpendicular bisectors is called Circumcentre.	 DO, EO and FO are the perpendicular bisectors
Orthocentre	The point of intersection of the three altitudes of the triangle is called as the orthocentre. $\angle BOC = 180° - \angle A$ $\angle COA = 180° - \angle B$ $\angle AOB = 180° - \angle C$	 'O' is the orthocentre

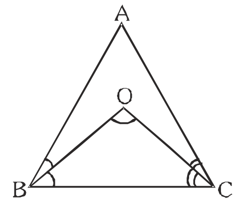
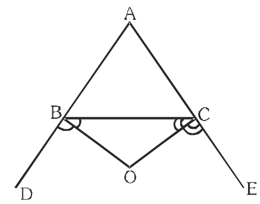
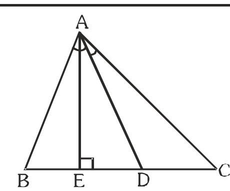
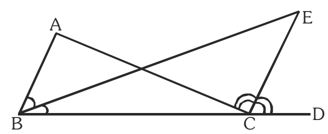
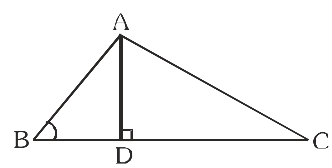
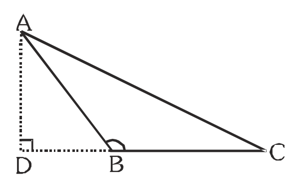
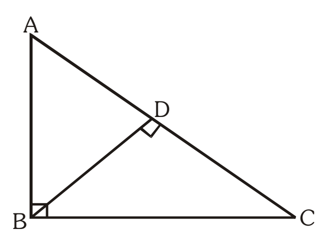
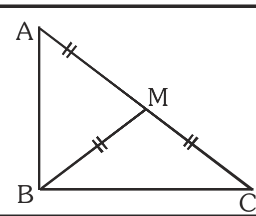
■ Theorems related to triangles

Theorem	Statement	Diagram
Basic proportionality theorem	In a triangle, a line drawn parallel to one side, will divide the other two sides in same ratio. If DE||BC, then $\frac{AD}{DB} = \frac{AE}{EC}$	
Vertical angle bisector	The bisector of the vertical angle of a triangle divides the base in the ratio of other two sides. $\frac{BD}{DC} = \frac{AB}{AC}$	
Pythagoras theorem	In a right angled triangle, the square of the hypotenuse is equal to the sum of squares of the other two sides. $AC^2 = AB^2 + BC^2$	
Theorem	Angles opposite to equal sides of a triangle are equal. If AB = BC then $\angle B = \angle C$	
Theorem	If two angles of a triangle are equal, then the sides opposite to them are also equal.If $\angle B = \angle C$ then AB = BC	
Exterior angle	If a side of a triangle is produced, the exterior angle so formed is equal to the sum of the two interior opposite angles. $\angle 4 = \angle 2 + \angle 3$	
Theorem	The sum of three angles in a triangle is 180°. $\angle A + \angle B + \angle C = 180°$	
Mid-point theorem	If the mid-points of two adjacent sides of a triangle are joined by a line segment, then this segment is parallel to the third side. i.e., if AD=BD and AE=CE then DE||BC	
Apollonius theorem	In a triangle, the sum of the squares of any two sides of a triangle is equal to twice the sum of the square of the median to the third side and square of half the third side. i.e. $AB^2+AC^2=2(AD^2+BD^2)$	 BD=CD AD is the median

■ Results on area of similar triangles

S.No.	Statement	Diagram
(1)	The areas of two similar triangles are proportional to the squares of their corresponding sides. If $\Delta ABC \sim \Delta DEF$ then $\frac{\text{Area of ABC}}{\text{Area of DEF}} = \frac{AB^2}{DE^2} = \frac{BC^2}{EF^2} = \frac{AC^2}{DF^2}$	
(2)	The areas of two similar triangles are proportional to the squares of their corresponding altitude. If $\Delta ABC \sim \Delta DEF$, $AL \perp BC$ and $DM \perp EF$ then $\frac{\text{Area of ABC}}{\text{Area of DEF}} = \frac{AL^2}{DM^2}$	
(3)	The areas of two similar triangles are proportional to the squares of their corresponding medians. If ABC ~ DEF and AP, DQ are their medians then $\frac{\text{Area of ABC}}{\text{Area of DEF}} = \frac{AP^2}{DQ^2}$	
(4)	The areas of two similar triangles are proportional to the squares of their corresponding angle bisector segments. If ABC ~ DEF and AX, DY are their bisectors of $\angle A$ and $\angle D$ respectively then $\frac{\text{Area of ABC}}{\text{Area of DEF}} = \frac{AX^2}{DY^2}$	
(5)	If D, E and F are respectively the mid-points of sides BC, CA and AB of an equilateral triangle ABC then ΔDEF is also an equilateral triangle.	

■ Some useful results

S.No.	Statement	Diagram
(1)	In a ΔABC, if the bisectors of $\angle B$ and $\angle C$ meet at O then $\angle BOC = 90° + (\angle A)/2$	
(2)	In a DABC, if sides AB and AC are produced to D and E respectively and the bisectors of $\angle DBC$ and $\angle ECB$ intersect at O, then $\angle BOC = 90° - (\angle A)/2$	
(3)	In a ΔABC, if AD is the angle bisector of $\angle BAC$ and $AE \perp BC$, $\angle DAE = \frac{1}{2}(\angle ABC - \angle ACB)$	
(4)	In a ΔABC, if side BC is produced to D and bisectors of $\angle ABC$ and $\angle ACD$ meet at E, then $\angle BEC = \frac{1}{2}\angle BAC$	
(5)	In an acute angle ΔABC, AD is a perpendicular dropped on the opposite side of $\angle A$ then $AC^2 = AB^2 + BC^2 - 2BD.\ BC$ $(\angle B < 90°)$	
(6)	In a obtuse angle ΔABC, AD is perpendicular dropped on BC. BC is produce to D to meet AD, then $AC^2 = AB^2 + BC^2 + 2\ BD\ BC$ $(\angle B > 90°)$	
(7)	In a right angle ΔABC, $\angle B = 90°$ and AC is hypotenuse the perpendicular BD is dropped on hypotenuse AC from right angle vertex B, then (i) $BD = \frac{AB \times BC}{AC}$ (ii) $AD = \frac{AB^2}{AC}$ (iii) $CD = \frac{BC^2}{AC}$ (iv) $\frac{1}{BD^2} = \frac{1}{AB^2} + \frac{1}{BC^2}$	
(8)	In a right angled triangle, the median to the hypotenuse $= \frac{1}{2} \times$ hypotenuse i.e, $BM = \frac{AC}{2}$	

1. In a triangle ABC, if AB, BC and AC are the three sides of the triangle, then which of the statements is necessarily true?

(1) AB + BC < AC (2) AB + BC > AC

(3) AB + BC = AC (4) $AB^2 + BC^2 = AC^2$.

2. The sides of a triangle are 12 cm, 8 cm and 6 cm respectively, the triangle is :

(1) acute (2) obtuse

(3) right (4) can't be determined

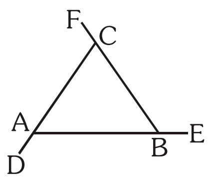
3. If the sides of a triangle are produced then the sum of the exterior angles i.e, ∠DAB + ∠EBC + ∠FCA is equal to :

(1) 180°

(2) 270°

(3) 360°

(4) 240°



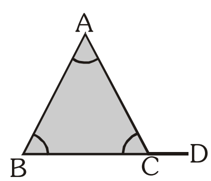
4. In the given figure BC is produced to D and ∠BAC = 40° and ∠ABC = 70°. Find the value of ∠ACD:

(1) 30°

(2) 40°

(3) 70°

(4) 110°



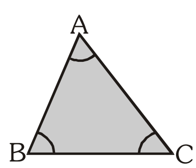
5. In a ΔABC, ∠BAC > 90°, then ∠ABC and ∠ACB must be :

(1) acute

(2) obtuse

(3) one acute and one obtuse

(4) can't be determined



6. If the angles of a triangle are in the ratio 1 : 4 : 7, then the value of the largest angle is :

(1) 135° (2) 84° (3) 105° (4) None

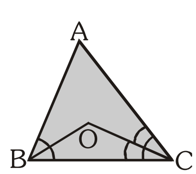
7. In the adjoining figure ∠B = 70° and ∠C = 30°. BO and CO are the angle bisectors of ∠ABC and ∠ACB. Find the value of ∠BOC :

(1) 30°

(2) 40°

(3) 120°

(4) 130°



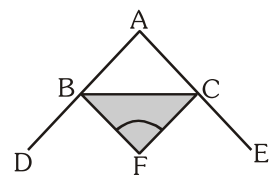
8. In the given diagram of ΔABC, ∠B = 80°, ∠C = 30°. BF and CF are the angle bisectors of ∠CBD and ∠BCE respectively. Find the value of ∠BFC :

(1) 110°

(2) 50°

(3) 125°

(4) 55°



9. In an equilateral triangle, the incentre, circumcentre, orthocentre and centroid are:

(1) concylic (2) coincident

(3) collinear (4) none of these

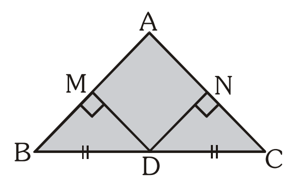
10. In the adjoining figure D is the midpoint of BC of a ΔABC. DM and DN are the perpendiculars on AB and AC respectively and DM = DN, then the ΔABC is :

(1) right angled

(2) isosceles

(3) equilateral

(4) scalene



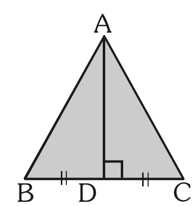
11. In the adjoining figure of ΔABC, AD is the perpendicular bisector of side BC. The triangle ABC is :

(1) right angled

(2) isosceles

(3) scalene

(4) equilateral



12. Triangle ABC is such that AB = 9 cm, BC = 6 cm, AC = 7.5 cm. Triangle DEF is similar to ΔABC, If EF = 12 cm then DE is :

(1) 6 cm (2) 16 cm

(3) 18 cm (4) 15 cm

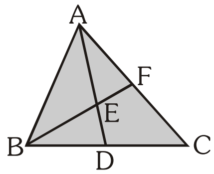
13. In ΔABC, AB = 5 cm, AC= 7 cm. If AD is the angle bisector of ∠A. Then BD : CD is:

(1) 25 : 49 (2) 49 : 25

(3) 6 : 1 (4) 5 : 7

14. In a ΔABC, D is the mid-point of BC and E is mid-point of AD, BF passes through E. What is the ratio of AF : FC ?

(1) 1 : 1
(2) 1 : 2
(3) 1 : 3
(4) 2 : 3



15. In a ΔABC, AB = AC and AD ⊥ BC, then :

(1) AB < AD (2) AB > AD
(3) AB = AD (4) AB ≤ AD

16. The difference between altitude and base of a right angled triangle is 17 cm and its hypotenuse is 25 cm. What is the sum of the base and altitude of the triangle is ?

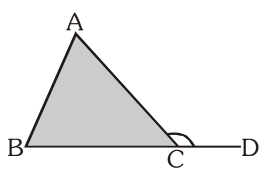
(1) 24 cm (2) 31 cm
(3) 34 cm (4) can't be determined

17. If AB, BC and AC be the three sides of a triangle ABC, which one of the following is true?

(1) AB – BC = AC (2) (AB – BC) > AC
(3) (AB – BA) < AC (4) $AB^2 - BC^2 = AC^2$

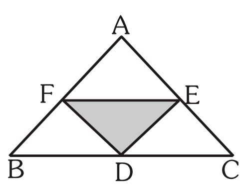
18. In the triangle ABC, side BC is produced to D. ∠ACD = 100° if BC = AC, then ∠ABC is :

(1) 40°
(2) 50°
(3) 80°
(4) can't be determined



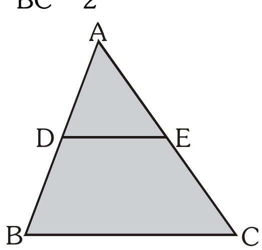
19. In the adjoining figure D, E and F are the mid-points of the sides BC, AC and AB respectively. ΔDEF is congruent to triangle :

(1) ABC
(2) AEF
(3) CDE , BFD
(4) AFE, BFD and CDE



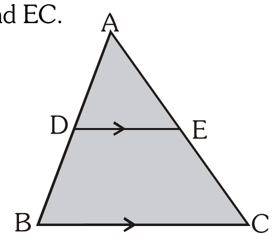
20. In the given figure, if $\frac{DE}{BC} = \frac{1}{2}$ and if AE = 10 cm. Find AC.

(1) 16 cm
(2) 12 cm
(3) 20 cm
(4) 18 cm



21. In the figure, DE | | BC and AD = 12 cm, AB = 20 cm and AE = 10 cm. Find EC.

(1) 14 cm
(2) 10 cm
(3) 5.8 cm
(4) 15 cm



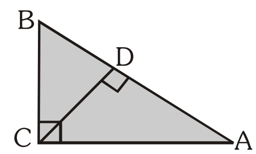
22. In a right angled ΔABC, ∠C = 90° and CD is the perpendicular on the hypotenuse AB, AB = c, BC = a, AC = b and CD = p, then:

(1) $\frac{p}{a} = \frac{p}{b}$

(2) $\frac{1}{p^2} + \frac{1}{b^2} = \frac{1}{a^2}$

(3) $p^2 = b^2 + c^2$

(4) $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$



23. If the medians of a triangle are equal, then the triangle is:

(1) right angled (2) isosceles
(3) equilateral (4) scalene

24. The incentre of a triangle is determined by the:

(1) medians
(2) angle bisectors
(3) perpendicular bisectors
(4) altitudes

25. The circumcentre of a triangle is determined by the:

(1) altitudes
(2) median
(3) perpendicular bisectors
(4) angle bisectors

26. The point of intersection of the angle bisectors of a triangle is :

(1) orthocentre (2) centroid
(3) incentre (4) circumcentre

27. A triangle PQR is formed by joining the mid-points of the sides of a triangle ABC. 'O' is the circumcentre of ΔABC, then for ΔPQR, the point 'O' is :

(1) incentre (2) circumcentre

(3) orthocentre (4) centroid

28. If in a ΔABC, 'S' is the circumcentre then:

(1) S is equidistant from all the vertices of a triangle

(2) S is equidistant from all the sides of a triangle

(3) AS, BS and CS are the angular bisectors

(4) AS, BS and CS produced are the altitudes on the opposite sides.

29. If AD, BE, CF are the altitudes of ΔABC whose orthocentre is H, then C is the orthocentre of :

(1) ΔABH (2) ΔBDH

(3) ΔABD (4) ΔBEA

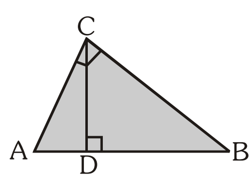
30. In a right angled ΔABC, $\angle C = 90°$ and CD is the perpendicular on hypotenuse AB. If BC = 15 cm and AC = 20 cm then CD is equal to :

(1) 18 cm

(2) 12 cm

(3) 17.5 cm

(4) can't be determined



31. In an equilateral ΔABC, if a, b and c denote the lengths of perpendiculars from A, B and C respectively on the opposite sides, then:

(1) $a > b > c$ (2) $a > b < c$

(3) $a = b = c$ (4) $a = c \neq b$

32. What is the ratio of side and height of an equilateral triangle?

(1) 2 : 1 (2) 1 : 1

(3) $2 : \sqrt{3}$ (4) $\sqrt{3} : 2$

33. The triangle is formed by joining the mid-points of the sides AB, BC and CA of ΔABC and the area of ΔPQR is 6 cm^2, then the area of ΔABC is :

(1) 36 cm^2 (2) 12 cm^2

(3) 18 cm^2 (4) 24 cm^2

34. One side other than the hypotenuse of right angle isosceles triangle is 6 cm. The length of the perpendicular on the hypotenuse from the opposite vertex is :

(1) 6 cm (2) $6\sqrt{2}$ cm

(3) 4 cm (4) $3\sqrt{2}$ cm

35. Any two of the four triangles formed by joining the midpoints of the sides of a given triangle are:

(1) congruent

(2) equal in area but not congruent

(3) unequal in area and not congruent

(4) none of these

36. The internal bisectors of $\angle B$ and $\angle C$ of ΔABC meet at O. If $\angle A = 80°$ then $\angle BOC$ is :

(1) 50° (2) 160°

(3) 100° (4) 130°

37. The point in the plane of a triangle which is at equal perpendicular distance from the sides of the triangle is :

(1) centroid

(2) incentre

(3) circumcentre

(4) orthocentre

38. Incentre of a triangle lies in the interior of :

(1) an isosceles triangle only

(2) a right angled triangle only

(3) any equilateral triangle only

(4) any triangle

39. In a triangle PQR, PQ = 20 cm and PR = 6 cm, the side QR is :

(1) equal to 14 cm

(2) less than 14 cm

(3) greater than 14 cm

(4) none of these

40. The four triangles formed by joining the pairs of mid-points of the sides of a given triangle are congruent if the given triangle is :

(1) an isosceles triangle

(2) an equilateral triangle

(3) a right angled triangle

(4) of any shape

41. O is orthocentre of a triangle PQR, which is formed by joining the mid-points of the sides of a ΔABC, O is :

(1) orthocentre

(2) incentre

(3) circumcentre

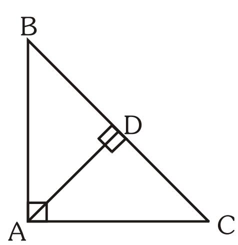
(4) centroid

42. In a ΔABC, a line PQ parallel to BC cuts AB at P and AC at Q. If BQ bisects $\angle PQC$, then which one of the following relations is always true:

(1) BC= CQ (2) BC = BQ

(3) $BC \neq CQ$ (4) $BC \neq BQ$

43. Which of the following is true, in the given figure, where AD is the altitude to the hypotenuse of a right angled ΔABC?



(i) ΔCAD and ΔABD are similar

(ii) ΔCDA and ΔADB are congruent

(iii) ΔADB and ΔCAB are similar

Select the correct answer using the codes given below:

(1) (i) and (ii) (2) (ii) and (iii)

(3) (i) and (iii) (4) (i), (ii) and (iii)

44. If D is such a point on the side, BC of ΔABC that $\frac{AB}{AC} = \frac{BD}{CD}$, then AD must be a/an:

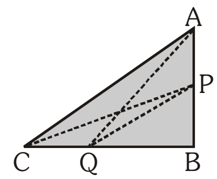
(1) altitude of ΔABC

(2) median of ΔABC

(3) angle bisector of ΔABC

(4) perpendicular bisector of ΔABC

45. In right angled ΔABC, $\angle ABC = 90°$, if P and Q are points on the sides AB and BC respectively, then:



(1) $AQ^2 + CP^2 = 2\,(AC^2 + PQ^2)$

(2) $AQ^2 + CP^2 = AC^2 + PQ^2$

(3) $(AQ^2 + CP^2) = \frac{1}{2}\,(AC^2 + PQ^2)$

(4) $(AQ + CP) = \frac{1}{2}\,(AC + PQ)$

46. If ABC is a right angled triangle at B and M, N are the mid-points of AB and BC, then $4\,(AN^2 + CM^2)$ is equal to –

(1) $4AC^2$ (2) $6AC^2$ (3) $5AC^2$ (4) $\frac{5}{4}AC^2$

47. If ΔABC and ΔDEF are so related that $\frac{AB}{FD} = \frac{BC}{DE} = \frac{CA}{EF}$, then which of the following is true?

(1) $\angle A = \angle F$ and $\angle B = \angle D$

(2) $\angle C = \angle F$ and $\angle A = \angle D$

(3) $\angle B = \angle F$ and $\angle C = \angle D$

(4) $\angle A = \angle E$ and $\angle B = \angle D$

48. ABC is a right angle triangle at A and AD is perpendicular to the hypotenuse. Then $\frac{BD}{CD}$ is equal to :

(1) $\left(\frac{AB}{AC}\right)^2$ (2) $\left(\frac{AB}{AD}\right)^2$

(3) $\frac{AB}{AC}$ (4) $\frac{AB}{AD}$

49. Let ABC be an equilateral triangle. Let BE ⊥ CA meeting CA at E, then $(AB^2 + BC^2 + CA^2)$ is equal to :

(1) $2BE^2$ (2) $3BE^2$

(3) $4BE^2$ (4) $6BE^2$

50. If D, E and F are respectively the mid-points of sides of BC, CA and AB of a ΔABC. If EF = 3 cm, FD = 4 cm, and AB = 10 cm, then DE, BC and CA respectively will be equal to :

(1) 6, 8 and 20 cm (2) 4, 6 and 8 cm

(3) 5, 6 and 8 cm (4) $\frac{10}{3}$, 9 and 12 cm

51. In the right angle triangle ∠C = 90°. AE and BD are two medians of a triangle ABC meeting at F. The ratio of the area of ΔABF and the quadrilateral FDCE is :

(1) 1 : 1 (2) 1 : 2

(3) 2 : 1 (4) 2 : 3

52. ABC is a triangle and DE is drawn parallel to BC cutting the other sides at D and E. If AB = 3.6 cm, AC = 2.4 cm and AD = 2.1 cm, then AE is equal to :

(1) 1.4 cm (2) 1.8 cm

(3) 1.2 cm (4) 1.05 m

53. Consider the following statements:

(1) If three sides of a triangle are equal to three sides of another triangle, then the triangles are congruent.

(2) If three angles of a triangle are equal to three angles of another triangle respectively, then the two triangles are congruent. Of these statements:

(1) 1 is correct and 2 is false

(2) both 1 and 2 are false

(3) both 1 and 2 are correct

(4) 1 is false and 2 is correct

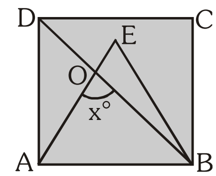
54. In the figure ΔABE is an equilateral triangle in a square ABCD. Find the value of angle x in degrees

(1) 60°

(2) 45°

(3) 75°

(4) 90°



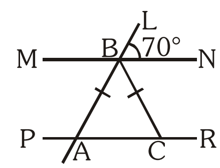
55. In the given diagram MN ∥ PR and m ∠LBN = 70°, AB = BC. Find m ∠ABC :

(1) 40°

(2) 30°

(3) 35°

(4) 55°



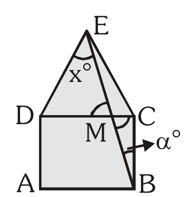
56. In the given diagram, equilateral triangle EDC surmounts square ABCD. Find the m ∠BED represented by x, where m ∠EBC = α°

(1) 45°

(2) 60°

(3) 30°

(4) None of these



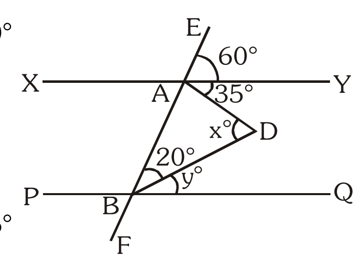
57. In the given diagram XY∥PQ. Find m∠x° and m∠y°

(1) 75° and 40°

(2) 45°, 60°

(3) 75°, 45°

(4) 60° and 45°



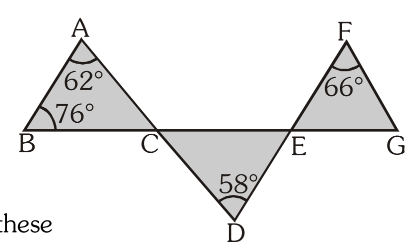
58. In the adjoining figure m ∠CAB = 62°, m ∠CBA = 76°, m∠ADE = 58° and ∠DFG = 66°, find m∠FGE

(1) 44°

(2) 34°

(3) 36°

(4) none of these



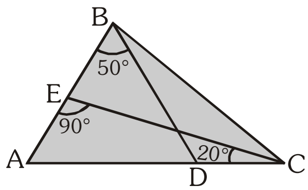
59. In the given figure CE ⊥ AB, m ∠ACE = 20° and m ∠ABD = 50°. Find m ∠BDA :

(1) 50°

(2) 60°

(3) 70°

(4) 80°



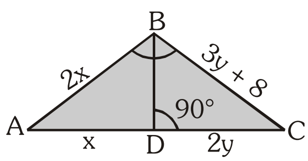
60. In the ΔABC, BD bisects ∠B, and is perpendicular to AC. If lengths of the sides of the triangle are expressed in terms of x and y as shown, find the value of x and y:

(1) 6, 12

(2) 10, 12

(3) 16, 8

(4) 8, 15



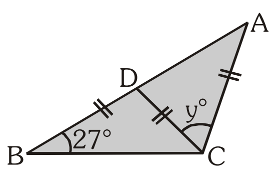
61. In the following figure ADBC, BD = CD = AC, m ∠ABC = 27° , m ∠ACD = y. Find the value of y.

(1) 27°

(2) 54°

(3) 72°

(4) 58°



62. ABC is an isosceles triangle with AB = AC. Side BA is produced to D such that AB = AD. Find m ∠BCD.

(1) 60°

(2) 90°

(3) 120°

(4) can't be determined

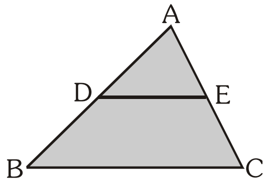
63. In ΔABC, AC = 5 cm. Calculate the length of AE where DE||BC, given that AD = 3 cm and BD = 7 cm.

(1) 2 cm

(2) 1 cm

(3) 1.5 cm

(4) 2.5 cm



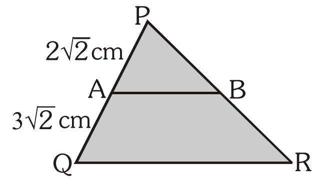
64. In ΔPQR, AP = $2\sqrt{2}$ cm, AQ = $3\sqrt{2}$ cm and PR = 10 cm, AB||QR. Find the length of BR.

(1) $6\sqrt{2}$ cm

(2) 6 cm

(3) $5\sqrt{2}$ cm

(4) none of these



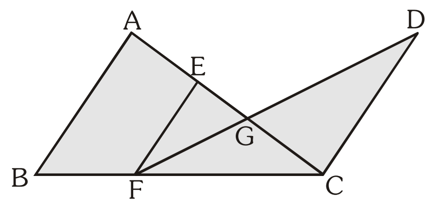
65. In the adjoining figure (not drawn to scale) AB, EF and CD are parallel lines. Given that EG = 5 cm, GC = 10 cm and DC = 18 cm. Calculate AC, if AB = 15 cm.

(1) 21 cm

(2) 25 cm

(3) 18 cm

(4) 28 cm



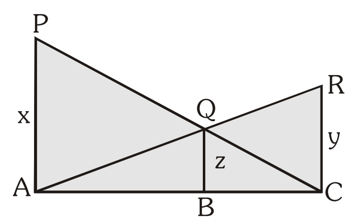
66. In the adjoining figure PA, QB and RC are each perpendicular to AC. Which one of the following is true?

(1) x + y = z

(2) xy = 2z

(3) $\frac{1}{x}+\frac{1}{y}=\frac{1}{z}$

(4) $\frac{1}{x}+\frac{1}{y}+\frac{1}{z}=0$



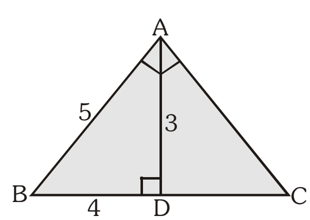
67. In the adjoining figure the ∠BAC and ∠ADB are right angles. BA = 5 cm, AD = 3 cm and BD = 4 cm, what is the length of DC ?

(1) 2.5

(2) 3

(3) 2.25

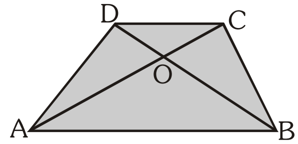
(4) 2



68. The areas of the similar triangles are in the ratio of 25 : 36. What is the ratio of their respective heights?

(1) 5 : 6 (2) 6 : 5 (3) 1 : 11 (4) 2 : 3

69. In the given diagram AB||CD, then which one of the following is true?



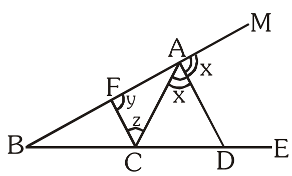
(1) $\frac{AB}{CD} = \frac{AO}{OC}$

(2) $\frac{AB}{CD} = \frac{BO}{OD}$

(3) $\Delta AOB \sim \Delta COD$

(4) all of these

70. The bisector of the exterior ∠A of ΔABC intersects the side BC produced to D. Here CF is parallel to AD.



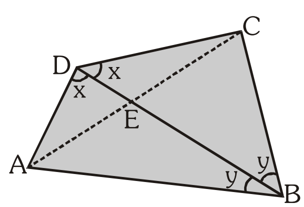
(1) $\frac{AB}{AC} = \frac{BD}{CD}$

(2) $\frac{AB}{AC} = \frac{CD}{BD}$

(3) $\frac{AB}{AC} = \frac{BC}{CD}$

(4) None of these

71. The diagonal BD of a quadrilateral ABCD bisects ∠B and ∠D, then:



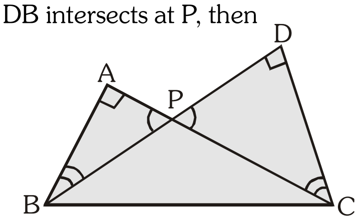
(1) $\frac{AB}{CD} = \frac{AD}{BC}$

(2) $\frac{AB}{BC} = \frac{AD}{CD}$

(3) AB = AD × BC

(4) None of these

72. Two right triangles ABC and DBC are drawn on the same hypotenuse BC on the same side of BC. If AC and DB intersects at P, then



(1) $\frac{AP}{PC} = \frac{BP}{DP}$

(2) AP × DP = PC × BP

(3) AP × PC = BP × DP

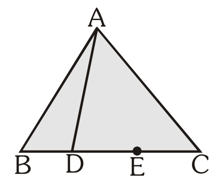
(4) AP × BP = PC × PD

73. A man goes 150 m due east and then 200 m due north. How far is he from the starting point?

(1) 200 m (2) 350 m

(3) 250 m (4) 175 m

74. In an equilateral triangle ABC, the side BC is trisected at D. Find the value of AD^2



(1) $\frac{9}{7}AB^2$ (2) $\frac{7}{9}AB^2$

(3) $\frac{3}{4}AB^2$ (4) $\frac{4}{5}AB^2$

75. ABC is a triangle in which ∠A = 90°. AN ⊥ BC, AC = 12 cm and AB = 5 cm. Find the ratio of the areas of ΔANC and ΔANB :

(1) 125 : 44 (2) 25 : 144

(3) 144 : 25 (4) 12 : 5

76. A vertical stick 15 cm long casts it shadow 10 cm long on the ground. At the same time a flag pole casts a shadow 60 cm long. Find the height of the flag pole.

(1) 40 cm (2) 45 cm

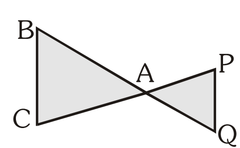
(3) 90 cm (4) None

77. Vertical angles of two isoceles triangles are equal. Then corresponding altitudes are in the ratio 4 : 9. Find the ratio of their areas :

(1) 16 : 49 (2) 16 : 81

(3) 16 : 65 (4) None

78. In the figure ΔACB ~ ΔAPQ. If BC = 8 cm, PQ = 4 cm, AP = 2.8 cm, find CA :



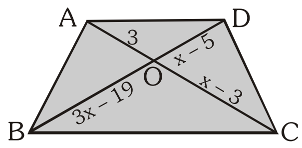
(1) 8 cm

(2) 6.5 cm

(3) 5.6 cm

(4) None of these

79. In the fig. BC||AD. Find the value of x :



(1) 9, 10 (2) 7, 8

(3) 10, 12 (4) 8, 9

80. In an equilateral triangle of side 2a, calculate the length of its altitude :

(1) $2a\sqrt{3}$ (2) $a\sqrt{3}$

(3) $a\frac{\sqrt{3}}{2}$ (4) None

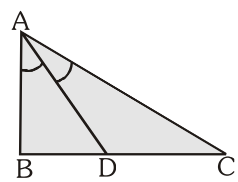
81. In fig. AD is the bisector of ∠BAC. If BD = 2 cm, CD = 3 cm and AB = 5 cm. Find AC :

(1) 6 cm

(2) 7.5 cm

(3) 10 cm

(4) 15 cm



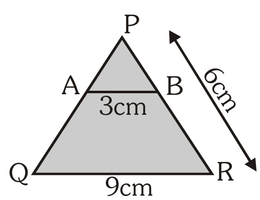
82. In the fig. AB||QR. Find the length of PB :

(1) 2 cm

(2) 3 cm

(3) 2.5 cm

(4) 4 cm



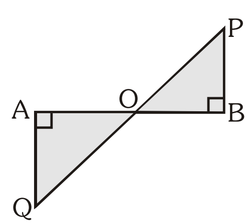
83. In the fig. QA and PB are perpendicular to AB. If AO = 10 cm, BO = 6 cm and PB = 9 cm. Find AQ

(1) 8 cm

(2) 9 cm

(3) 15 cm

(4) 12 cm



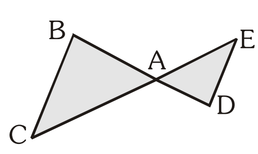
84. In the given figure AB = 12 cm, AC = 15 cm and AD = 6 cm. BC||DE, find the length of AE:

(1) 6 cm

(2) 7.5 cm

(3) 9 cm

(4) 10 cm



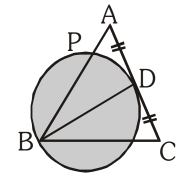
85. In the figure, ABC is a triangle in which AB = AC. A circle through B touches AC at D and intersects AB at P. If D is the mid·point of AC, Find the value of AB.

(1) 2AP

(2) 3AP

(3) 4AP

(4) none of the above



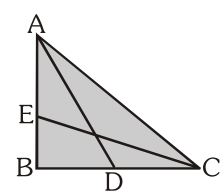
86. In figure, ABC is a right triangle, right angled at B. AD and CE are the two medians drawn from A and C respectively. If AC = 5 cm and AD = $\frac{3\sqrt{5}}{2}$ cm, find the length of CE:

(1) $2\sqrt{5}$ cm

(2) 2.5 cm

(3) 5 cm

(4) $4\sqrt{2}$ cm



87. In a ΔABC, AB = 10 cm, BC = 12 cm and AC = 14 cm. Find the length of median AD. If G is the centroid, find length of GA :

(1) $\frac{5}{3}\sqrt{7}, \frac{5}{9}\sqrt{7}$ (2) $5\sqrt{7}, 4\sqrt{7}$

(3) $\frac{10}{\sqrt{3}}, \frac{8}{3}\sqrt{7}$ (4) $4\sqrt{7}, \frac{8}{3}\sqrt{7}$

88. ΔABC is a right angled triangle at A and AD is the altitude to BC. If AB = 7 cm and AC = 24 cm. Find the ratio of AD is to AM if M is the mid-point of BC.

(1) 25 : 41 (2) 32 : 41

(3) $\frac{336}{625}$ (4) $\frac{625}{336}$

89. Area of ΔABC = 30 cm^2. D and E are the mid-points of BC and AB respectively. Find ar (ΔBDE).

(1) 10 cm (2) 7.5 cm

(3) 15 cm (4) None

90. The three sides of a triangles are given. Which one of the following is not a right triangle?

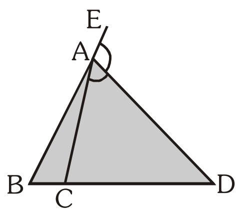
(1) 20, 21, 29

(2) 16, 63, 65

(3) 56, 90, 106

(4) 36, 35, 74

91. In the figure AD is the external bisector of $\angle EAC$, intersects BC produced to D. If AB = 12 cm, AC = 8 cm and BC = 4 cm, find CD.



(1) 10 cm

(2) 6 cm

(3) 8 cm

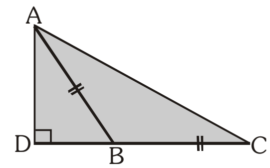
(4) 9 cm

92. In ΔABC, $AB^2 + AC^2 = 2500$ cm^2 and median AD = 25 cm, find BC.

(1) 25 cm (2) 40 cm

(3) 50 cm (4) 48 cm

93. In the given figure, AB = BC and $\angle BAC = 15°$, AB = 10 cm. Find the area of ΔABC.



(1) 50 cm^2

(2) 40 cm^2

(3) 25 cm^2

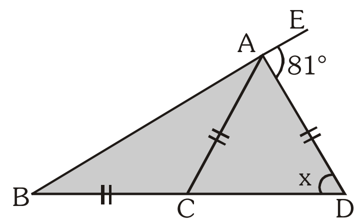
(4) 32 cm^2

94. In ΔABC, G is the centroid, AB = 15 cm, BC = 18 cm and AC = 25 cm. Find GD, where D is the mid-point of BC.

(1) $\frac{1}{3}\sqrt{86}$ cm (2) $\frac{2}{3}\sqrt{86}$ cm

(3) $\frac{8}{3}\sqrt{15}$ cm (4) None of these

95. In the given fig, BC = AC = AD, $\angle EAD = 81°$. Find the value of x.



(1) 45°

(2) 54°

(3) 63°

(4) 36°

ANSWER KEY

Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Ans.	2	2	3	4	1	3	4	4	2	2	2	3	4	2	
Que.	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Ans.	2	3	2	4	3	1	4	3	2	3	3	3	1	1	
Que.	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**
Ans.	3	3	4	4	1	4	2	4	3	4	3	1	3	3	
Que.	**46**	**47**	**48**	**49**	**50**	**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**
Ans.	3	1	1	3	3	1	1	1	3	1	1	1	2	2	
Que.	**61**	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	**70**	**71**	**72**	**73**	**74**	**75**
Ans.	3	2	3	2	2	3	3	1	4	1	2	3	3	2	
Que.	**76**	**77**	**78**	**79**	**80**	**81**	**82**	**83**	**84**	**85**	**86**	**87**	**88**	**89**	**90**
Ans.	3	2	3	4	2	2	1	3	2	3	1	4	3	2	
Que.	**91**	**92**	**93**	**94**	**95**										
Ans.	3	3	3	2	2										