SATISH SCIENCE ACADEMY

DHANORI PUNE-411015

TRIANGLES

Class 09 - Mathematics

Time Allowed: 3 hours **Maximum Marks: 183**

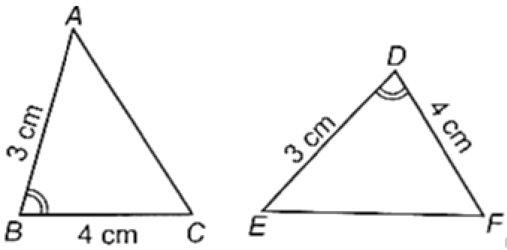
Section A

1. If $\triangle PQR \equiv \triangle EFD$, then $\angle E =$ **[1]**

   a) $\angle Q$ and $\angle R$ b) $\angle P$

   c) $\angle Q$ d) $\angle R$

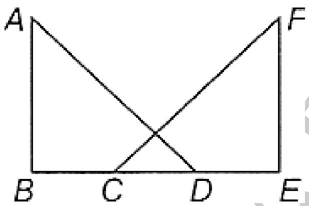
2. If the given triangles are congruent, then which of the following options is CORRECT? **[1]**



   a) $\triangle$ACB $\cong$ $\triangle$ EDF b) $\triangle$ABC $\cong$ $\triangle$EDF

   c) $\triangle$ABC $\cong$ $\triangle$ADE d) $\triangle$ABC $\cong$ $\triangle$FDE

3. In the given figure, AB $\perp$ BE and FE $\perp$ BE. If AB = FE and BC = DE, then **[1]**



   a) $\triangle$ABD $\cong$ $\triangle$CEF b) $\triangle$ABD $\cong$ $\triangle$EFC

   c) $\triangle$ABD $\cong$ $\triangle$FEC d) $\triangle$ABD $\cong$ $\triangle$FCE

4. $\triangle ABC \cong \triangle PQR$, then which of the following is true? **[1]**

   a) CA = RP b) CB = QP

   c) AB = RP d) AC = RQ

5. Line sgements AB and CD intersect at O such that AC||DB. If $\angle$CAB = 45° and $\angle$CDB = 55°, then $\angle$BOD = **[1]**

   a) 135° b) 80°

   c) 100° d) 90°

6. In a $\triangle ABC$, if $\angle A - \angle B = 42^\circ$ and $\angle B - \angle C = 21^\circ$ then $\angle B$ = ? **[1]**

   a) 95^o b) 63^o

   c) 53^o d) 32^o

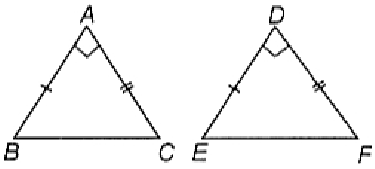
7. In a $\triangle ABC$, if $3\angle A = 4\angle B = 6\angle C$ then A : B : C = ? **[1]**

a) 6 : 4 : 3
b) 2 : 3 : 4
c) 3 : 4 : 6
d) 4 : 3 : 2

8. AD, BE and CP, the altitudes of $\triangle$ABC are equal. Then **[1]**

a) AC = BC
b) AB =- CF
c) AB = BC
d) AD = AB

9. If AB = DE, AC = DF, $\angle$A = $\angle$D = 90° and BC = 5 cm, then EF is equal to _____. **[1]**



a) Can't be determined
b) 5 cm
c) 5.5 cm
d) 4.5 cm

10. In $\triangle ABC$, $\angle C = \angle A$ and BC = 6 cm and AC = 5 cm. Then the length of AB is: **[1]**

a) 2.5 cm
b) 6 cm
c) 5 cm
d) 3 cm

11. A triangle that has no equal sides and no equal angles is known as **[1]**

a) right angle
b) isosceles triangle
c) equilateral triangle
d) scalene triangle

12. in ΔABC and ΔDEF it is given that AB = DE and BC = EF in order that $\Delta ABC \cong \Delta DEF$, we must have **[1]**

a) $\angle C = \angle F$
b) $\angle A = \angle D$
c) $\angle B = \angle E$
d) $\angle C = \angle E$

13. In the given figure, if AE = AD and BD = CE, then ________. **[1]**

a) $\triangle$BEC $\cong$ $\triangle$BCD
b) BC = CD
c) None of thes
d) $\triangle$AEB $\cong$ $\triangle$ADC

14. ABC is a right triangle such that AB = AC and bisector of angle C intersects the side AB at D. Then AC + AD = ________. **[1]**

a) BC
b) 3BC
c) 4BC
d) 2BC

15. It is given that $\triangle$ABC $\cong$ $\triangle$FDE and AB = 5 cm, $\angle$B = 40° and $\angle$A = 80°. Then which of the following is true? **[1]**

a) DE = 5 cm, $\angle$E = 60°
b) DF = 5 cm, $\angle$E = 60°
c) DF = 5 cm, $\angle$F = 60°
d) DE = 5 cm, $\angle$D = 40°

16. If the sides of a triangle are produced in order, then the sum of the three exterior angles so formed is **[1]**

a) 90°
b) 270°
c) 180°
d) 360°

17. If the measures of angles of a triangle are in the ratio of 3 : 4 : 5, what is the measure of the smallest angle of the triangle? **[1]**

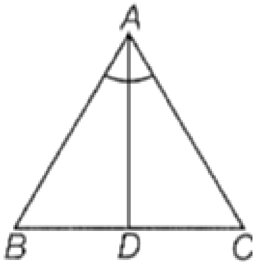
a) 60°

b) 45°

c) 30°

d) 25°

18. If AD is bisector of ∠A and it is perpendicular to BC. Then △ABC is ________ triangle. **[1]**



a) Scalene

b) Isosceles

c) Acute triangle

d) Equilateral

19. The cost of turfing a triangular field at the rate of Rs. 45 per 100 m^2 is Rs. 900. If the double the base of the triangle is 5 times its height, then its height is **[1]**

a) 40 m

b) 42 m

c) 32 m

d) 44 m

20. Which of the following is not a criterion for congruence of triangles? **[1]**

a) ASA

b) SAS

c) SSA

d) SSS

21. **Assertion (A):** In ΔABC and ΔPQR, AB = PQ, AC = PR and ∠BAC = ∠QPR **[1]**
ΔABC ≅ ΔPQR
Reason (R): Both the triangles are congruent by SSS congruence.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

22. **Assertion (A):** In triangles ABC and PQR, $\angle A = \angle P, \angle C = \angle R$ and AC = PR. The two triangles are congruent by ASA congruence. **[1]**
Reason (R): If two angles and included side of a triangle are equal to the corresponding angles and side of the other triangle then the triangles are congruent by ASA congruence criteria.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

23. **Assertion (A):** When two triangles are congruent then their corresponding angles are equal. **[1]**
Reason (R): Two triangles are congruent if their shapes and size are not same.

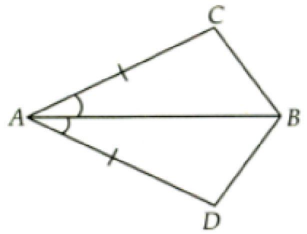
a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

24. **Assertion (A):** In a quadrilateral ABCD, AC = AD and AB bisect ∠A (see figure) by SAS congruence criteria. **[1]**



Reason (R): Two triangles are congruent if two sides and the included angle of one triangle is equal to the corresponding two sides and included angle of the other.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

25. **Assertion (A):** Angles opposite to equal sides of a triangle are equal. **[1]**
Reason (R): Sides opposite to equal angles of a triangle are not equal.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

26. **Assertion (A):** If the base and the altitude of a triangle are 4 cm and 8 cm respectively, then its area is 36 cm^2. **[1]**
Reason (R): Area of a triangle = $\frac{1}{2} \times$ base $\times$ altitude.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

27. **Assertion (A):** If the bisector of the vertical angle of a triangle bisects the base of the triangle, then the triangle is equilateral. **[1]**
Reason (R): If three sides of one triangle are equal to three of the other triangle, then the two triangles are congruent.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

28. **Assertion (A):** In ΔABC, AB = AC and $\angle B = 50^o$, then $\angle C$ is 50^o. **[1]**
Reason (R): In a triangle, angles opposite to equal sides are equal.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

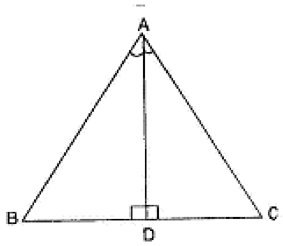
29. **Assertion (A):** If we draw two triangles with angles 30^o, 70^o and 80^o and the length of the sides of one triangle be different than that of the corresponding sides of the other triangle then two triangles are not congruent. **[1]**
Reason (R): If two triangles are constructed which have all corresponding angles equal but have unequal corresponding sides, then two triangles cannot be congruent to each other.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false. d) A is false but R is true.

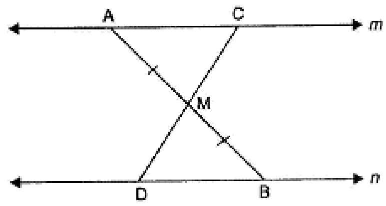
Section B

30. Prove that $\triangle ABC$ is an isosceles, if bisector of $\angle BAC$ is perpendicular to BC. **[2]**



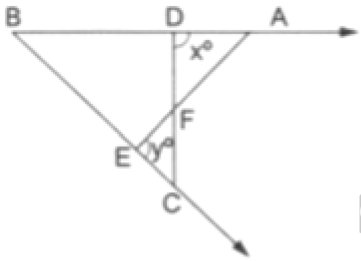
31. AB is a line segment and line l is its perpendicular bisector. If a point P lies on l, show that P is equidistant from A and B. **[2]**

32. In figure, m || n and M is the mid-point of line segment AB, where A and B are any points on m and n respectively. Prove that M is also the mid-point of any other line segment CD having its end points on m and n respectively. **[2]**

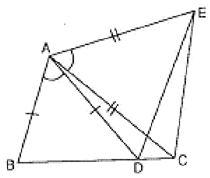


33. Find all the angles of an equilateral triangle. **[2]**

34. In the given figure, if x = y and AB = CB then prove that AE = CD. **[2]**

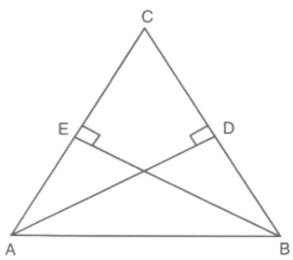


35. In figure, AC = AE, AB = AD and $\angle BAD = \angle EAC$. Show that BC = DE. **[2]**

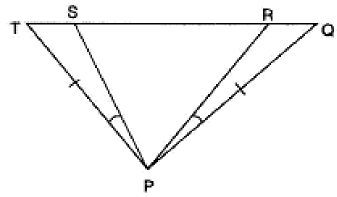


36. Prove that the medians of an equilateral triangle are equal. **[2]**
Given $\triangle$ ABC in which AB = BC = AC and AD, BE and CF are its medians.

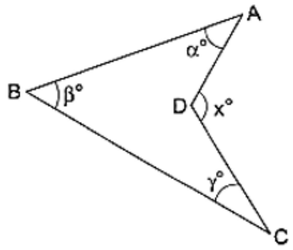
37. In figure, AD and BE are respectively altitudes of an isosceles triangle ABC with AC = BC, Prove that AE = BD. **[2]**



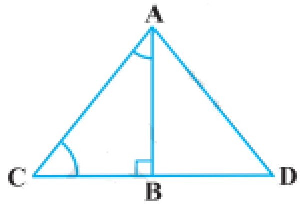
38. In figure, PQ = PT and $\angle TPS = \angle QPR$. Prove that triangle PRS is isosceles. **[2]**



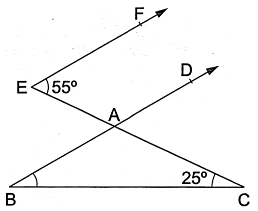
39. In the given figure, prove that $x = \alpha + \beta + \gamma$.. **[2]**



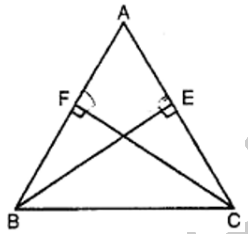
40. In Fig., ABC is a right triangle and right-angled at B such that ∠BCA = 2∠BAC. Show that hypotenuse AC = 2BC **[2]**



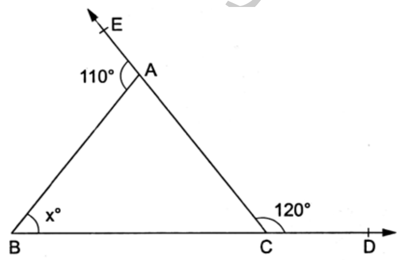
41. In the given figure, BAD || EF, ∠AEF = 55^o and $\angle ACB$ = 25^o, find $\angle ABC$. **[2]**



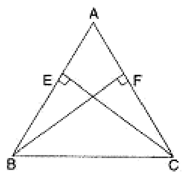
42. ABC is an isosceles triangle in which altitudes BE and CF are drawn to equal sides AC and AB respectively (See figure). Show that these altitudes are equal. **[2]**



43. Calculate the value of x in each of the the given figure. **[2]**



44. ABC is an isosceles triangle in which altitudes BF and CE are drawn to sides AC and AB respectively. Show that these altitudes are equal. **[2]**

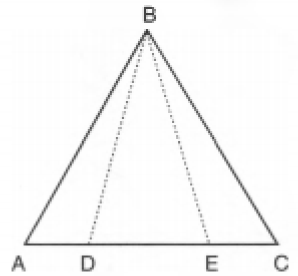


Section C

45. If the angles of a triangle are in the ratio 2 : 1 : 3, then find the measure of smallest angle. **[3]**

46. Bisectors of the angles B and C of an isosceles triangle with AB = AC intersect each other at O. BO is produced to a point M. Prove that ∠ MOC = ∠ ABC. **[3]**

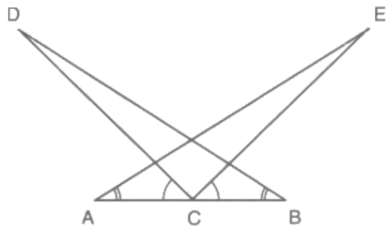
47. In Fig., it is given that AB = BC and AD = EC. Prove that **[3]**



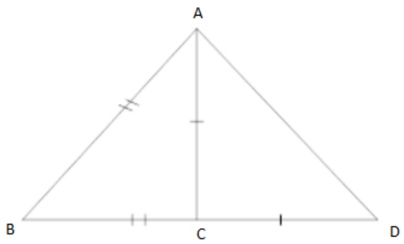
i. ΔABE ≅ ΔCBD

ii. BD = BE

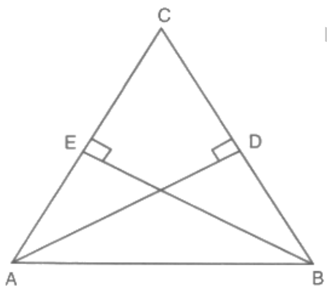
48. In figure, AC = BC, ∠DCA = ∠ECB and ∠DBC = ∠EAC. Prov triangles DBC and EAC are congruent, and hence DC = EC and BD = AE. **[3]**



49. From the following figure, prove that ∠BAD = 3 ∠ADB. **[3]**



50. In given figure, AD and BE are respectively altitudes of a triangle ABC such that AE = BD. Prove that AD = BE. **[3]**



51. In △ABC, if bisectors of ∠ABC and ∠ACB intersect at O at angle of 120°, then find the measure of ∠A. **[3]**

52. △ABC is an isosceles triangle in which AB = AC. Side BA is produced to D such that AD = AB. Show that ∠BCD is a right angle. **[3]**

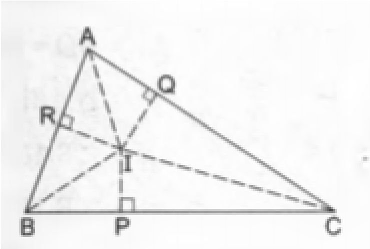
53. ABC is an isosceles triangle with AB = AC and AD is altitude of the triangle. Prove that AD is also a median of the triangle. **[3]**

54. BE and CF are two equal altitudes of a triangle ABC. Using RHS congruence rule, prove that a triangle ABC is isosceles: **[3]**

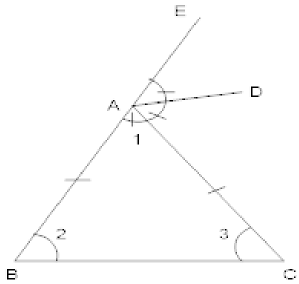
55. In the given figure, the bisectors of $\angle B$ and $\angle C$ of △ABC meet at I if $IP \perp BC, \quad IQ \perp CA$ and $IR \perp AB$ **[3]**

i. IP = IQ = IR and

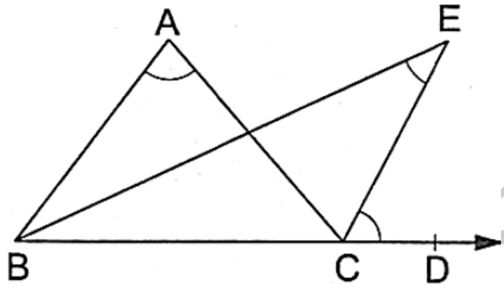
ii. IA bisects $\angle A$.



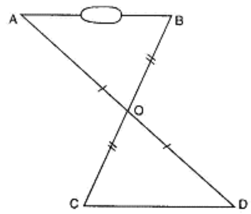
56. $\triangle$ABC is an isosceles triangle with AB = AC. AD bisects the exterior $\angle$A. prove that AD || BC. **[3]**



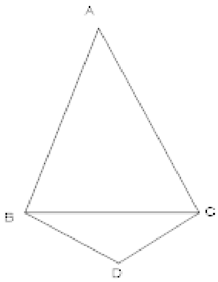
57. In the given figure, the side BC of $\triangle$ABC has been produced to a point D. If the bisectors of $\angle$ABC and $\angle$ACD meet at point E then prove that $\angle BEC = \frac{1}{2}\angle BAC$. **[3]**



58. Swati wishes to determine the distance between two objects A and B but there is an obstacle between these two objects which prevents her from making a direct measurement. She devises an ingenious way to overcome this difficulty. First she fixes a pole at a convenient point O so that both A and B are visible. Then she fixes another pole at a point D on the line AO (produced) such that AO = DO. In a similar way, she fixes a third pole at a point C on the line BO (produced) such that BO = CO. Then she measures CD and finds that CD = 540 cm. Prove that the distance between objects A and B is also 540 cm. **[3]**



59. In the given figure, ABC and DBC are two triangles on the same base BC such that AB = AC and DB = DC. Prove that $\angle$ABD = $\angle$ACD, **[3]**

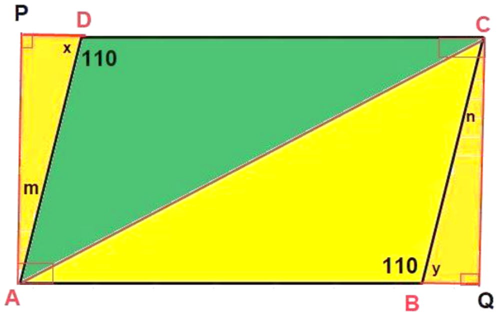


Section D

60. **Read the following text carefully and answer the questions that follow:** **[4]**

In the middle of the city, there was a park ABCD in the form of a parallelogram form so that AB = CD, AB||CD and AD = BC, AD || BC.

Municipality converted this park into a rectangular form by adding land in the form of ΔAPD and Δ BCQ. Both the triangular shape of land were covered by planting flower plants.



i. Show that ΔAPD and ΔBQC are congruent. (1)

ii. PD is equal to which side? (1)

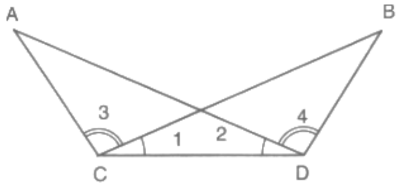
iii. Show that ΔABC and ΔCDA are congruent. (2)

OR

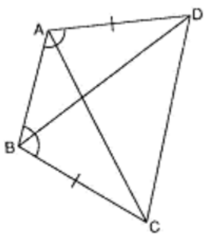
What is the value of ∠m? (2)

Section E

61. In figure, ∠BCD = ∠ADC and ∠ACB = ∠BDA. Prove that AD = BC and ∠A = ∠B. **[5]**



62. ABCD is a quadrilateral in which AD = BC and ∠DAB = ∠CBA. **[5]**



Prove that: ΔABD ≅ ΔBAC

63. BD and CE are the bisectors of ∠B and ∠C of an isosceles triangle ABC with AB = AC. Prove that BD = CE. **[5]**

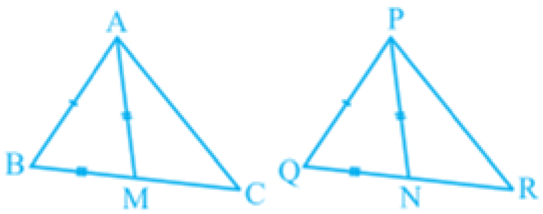
64. Line segment joining the mid-points M and N of parallel sides AB and DC, respectively of a trapezium ABCD is perpendicular to both the sides AB and DC. Prove that AD = BC. **[5]**

65. In Δ ABC, locate a point in its interior which is equidistant from all the sides of the ΔABC. **[5]**

66. Two sides AB and BC and median AM of one triangle ABC are respectively equal to sides PQ and QR and median PN of △PQR (See figure). Show that: **[5]**

i. $\triangle ABM \cong \triangle PQN$

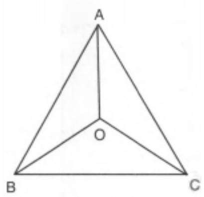
ii. $\triangle ABC \cong \triangle PQR$



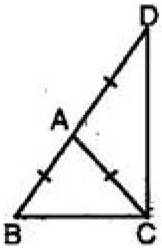
67. If the bisector of an angle of a triangle bisects the opposite side, prove that the triangle is isosceles. **[5]**

68. ABCD is quadrilateral such that AB = AD and CB = CD. Prove that AC is the perpendicular bisector of BD. **[5]**

69. In $\triangle ABC$, AB = AC, and the bisectors of angles B and C intersect at point O. Prove that BO = CO and the ray AO is the bisector of angle BAC. **[5]**



70. ΔABC 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. **[5]**

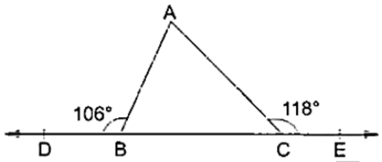


71. O is a point in the interior of a square ABCD such that OAB is an equilateral triangle. Show that Δ OCD is an isosceles triangle. **[5]**

72. ABCD is a quadrilateral in which AB = AD, BC = DC and diagonals intersect at point E. Prove that **[5]**

   i. AC bisects each of the angles A and C.
   ii. BE = ED
   iii. $\angle ABC = \angle ADC$. Is AE = EC ?

73. In the given figure, the side BC of $\triangle ABC$ has been produced on both sides-on the left to D and on the right to E . If $\angle ABD = 106^\circ$ and $\angle ACE = 118^o$, find the measure of each angle of the triangle. **[5]**



74. In a right triangle, prove that the line-segment joining the mid-point of the hypotenuse to the opposite vertex is half the hypotenuse. **[5]**

75. Bisectors of the angles B and C of an isosceles triangle ABC with AB = AC intersect each other at O. Show that external angle which is adjacent to $\angle$ ABC is equal to $\angle$ BOC. **[5]**