TB(3A) Ch. 3 Special Lines & Centres in a Triangle

Conventional Questions

1. [13-14 Standardized Test 1]

In **Figure 1**, $AB = AC$ and $AB \parallel CD$.

(a) If DC is an altitude of ΔADE, find $\angle DCB$. **(3 marks)**

(b) If $AD = DE$, prove that DC is a perpendicular bisector of ΔADE. **(2 marks)**

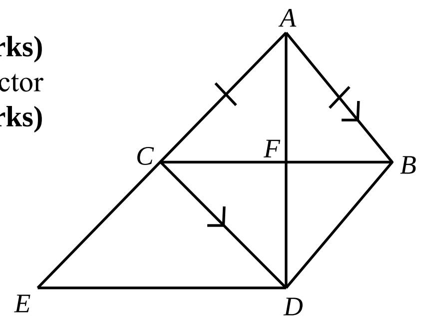

Figure 1

2. [13-14 Mid-year Exam Q2]

The lengths of two sides of an isosceles triangle are 3 cm and 6 cm. Mary claims that the possible perimeters of the triangle are 12 cm and 15 cm. Do you agree? Explain your answer. **(3 marks)**

3. [13-14 Mid-year Exam Q3]

In **Figure 1**, X is the incentre of ΔABC. $\angle CAX = 20°$ and $\angle CBX = 30°$. Find x and y. **(4 marks)**

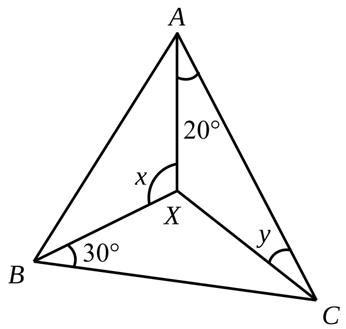

Figure 1

4. [13-14 Mid-year Exam Q10]

In **Figure 4**, $BFCH$ is a straight line. D and G are points on AC and AB respectively. DF and CG intersect at E. DF is a perpendicular bisector of ΔABC, $\angle GEF = x + 90°$ and $\angle ADE = 2x + 90°$ where $x > 0°$.

(a) Prove that CE is an angle bisector of ΔDFC. **(2 marks)**

(b) If $\angle ACH = 2\angle A$, prove that CG is a perpendicular bisector of ΔABC. **(3 marks)**

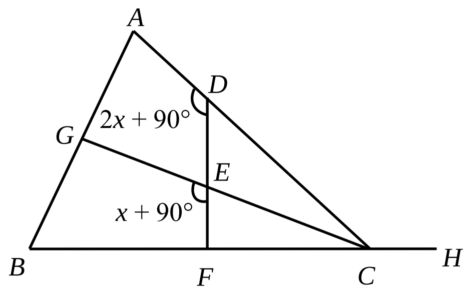

Figure 4

5. [13-14 Final Exam #11]

In **Figure 6**, AD and AB are altitudes of ΔABC. $AD = 3$ cm and $DC = 4$ cm.

(a) Prove that $\Delta ADC \sim \Delta BAC$. **(2 marks)**

(b) Find the length of BC. **(3 marks)**

(c) Write down the orthocentre of ΔABC. **(1 mark)**

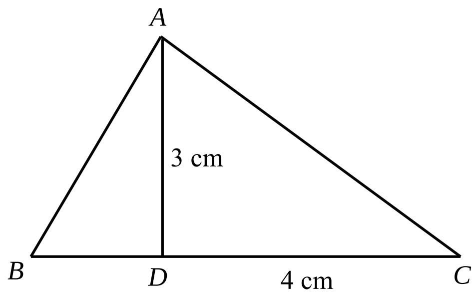

Figure 6

6. [14-15 Mid-year Exam #6]

In **Figure 2**, E and F are mid-points of AB and BC respectively. DE is perpendicular bisector of AC, and $ED \parallel BC$. $AGKF$ and EKC are straight lines.

(a) Prove that $\Delta AED \sim \Delta ABC$. **(2 marks)**

(b) Write down

(i) the orthocentre of ΔABC, **(1 mark)**

(ii) the centroid of ΔABC. **(1 mark)**

(c) Prove that $AE + AD > \dfrac{BC}{2}$. **(2 marks)**

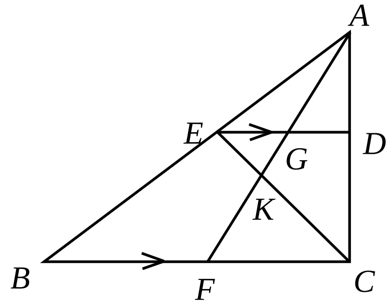

Figure 2

7. [14-15 Final Exam #10]

Figure 5(a) shows ΔABC and D is a point on BC. It is given that AD is an angle bisector and an altitude of the triangle.

(a) Prove that $\Delta ADB \cong \Delta ADC$. **(2 marks)**

(b) If $AB = 4\sqrt{5}$ cm and $BD = 4$ cm,

(i) find AD. **(1 mark)**

(ii) In **Figure 5(b)**, O is the circumcentre of ΔABC. Find OB. **(2 marks)**

(Hint: O is equidistant from A, B and C.)

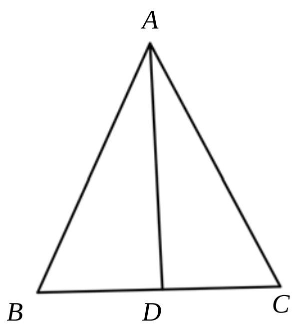

Figure 5(a)

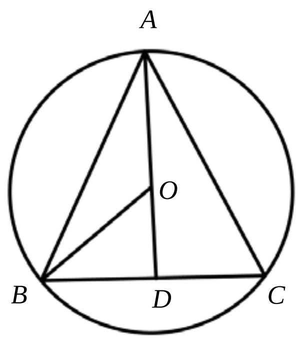

Figure 5(b)

8. [15-16 Mid-year Exam #9]

In **Figure 5**, O is the centroid of ΔPQR. MOR and NOP are straight lines. $PM = 6$ cm, $QN = 8$ cm and $\angle PQR = 90°$.

(a) Find the length of PR. **(3 marks)**

(b) Write down the orthocentre of ΔMQR. **(1 mark)**

(c) Rachel claimed that $MO = NO$. Do you agree? Explain briefly. **(3 marks)**

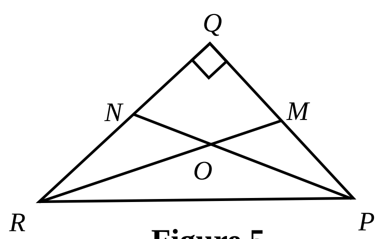

Figure 5

9. [15-16 Final Exam #13]

In **Figure 6**, AD is a perpendicular bisector of BC while BE is an intersect at F.

(a) Prove $\Delta ABD \cong \Delta ACD$. **(2 marks)**

(b) Charlotte claims that the incentre of ΔABC lies on AD. Do you agree? Explain your answer. **(1 mark)**

(c) Prove $AF \times FD = BF \times FE$. **(2 marks)**

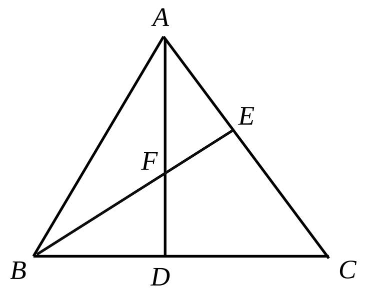

Figure 6

10. [16-17 Mid-year Exam #3]

The perimeter of an isosceles triangle is 28 cm and the length of one side is 6 cm. Janice claims that two different types of triangles can be formed. Do you agree? Explain your answer briefly.

(3 marks)

11. [16-17 Mid-year Exam #13]

Figure 5 shows a right-angled isosceles triangle ΔABC with $AB = BC = 10$ cm. I is the incentre of ΔABC.

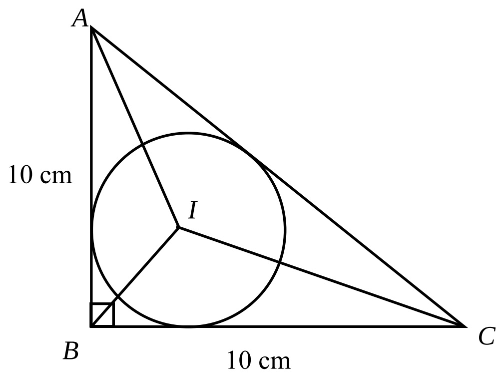

Figure 5

(a) Find $\angle ICB$. **(2 marks)**

(b) Write down the orthocentre of ΔABC. **(1 mark)**

(c) It is given that the radius of the inscribed circle is r cm, find the value of r. **(3 marks)**

12. [16-17 Mid-year Exam #14]

In **Figure 6**, $ABCD$ is a quadrilateral where $DC > AD > AB > BC$. Joseph claims that the perimeter of $ABCD$ is less than the sum of lengths of its diagonals. Do you agree? Explain your answer briefly.

(2 marks)

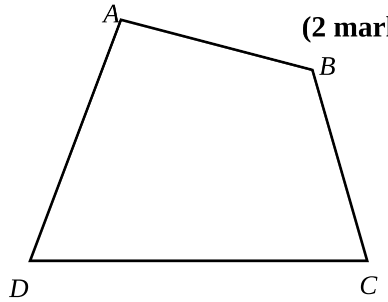

Figure 6

13. [16-17 Final Exam #18]

In **Figure 8**, I is the incentre of ΔABC, where $\angle BAC = a$, $\angle ABC = b$ and $\angle ACB = c$.

(a) Express $\angle BIC$ in terms of b and c. **(2 marks)**

(b) Hence, show that $\angle BIC$ is an obtuse angle. **(2 marks)**

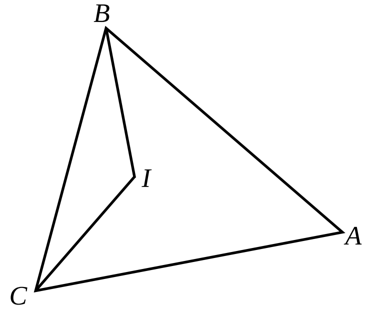

Figure 8

14. [17-18 Mid-year Exam #6]

In **Figure 2**, $ABCD$ is a trapezium with AB // DC. H is a point inside $ABCD$ such that AH and DH are angle bisectors of $\angle BAD$ and $\angle ADC$ respectively. Let $\angle BAH = x$, find $\angle AHD$.

(3 marks)

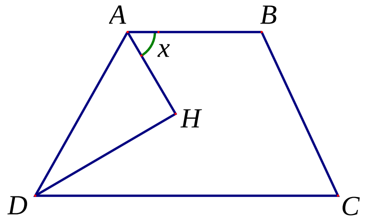

Figure 2

15. [17-18 Mid-year Exam #11]

In **Figure 6**, $ABCD$ is a parallelogram. B is the midpoint of AE. DE cuts BC at F. AF and BD cuts at G.

(a) Prove that G is the centroid of ΔADE. **(2 marks)**

(b) A student claims that the centroid of ΔBCD lies on DF.

Do you agree? Explain your answer. **(3 marks)**

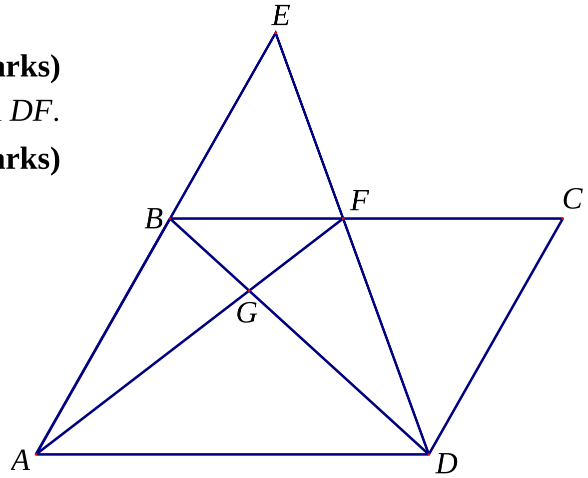

Figure 6

~ End ~