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

Conventional Questions

1. **[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* // *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)**

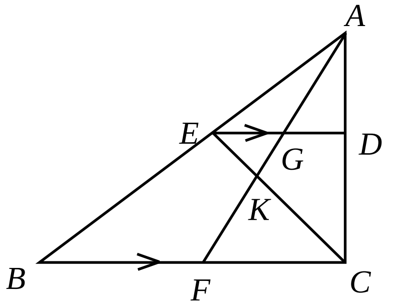


Figure 2

2. **[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*.)

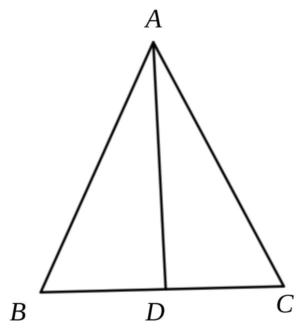


Figure 5(a)

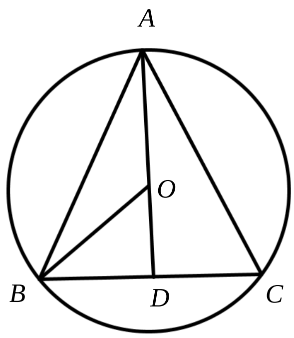


Figure 5(b)

3. **[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)**

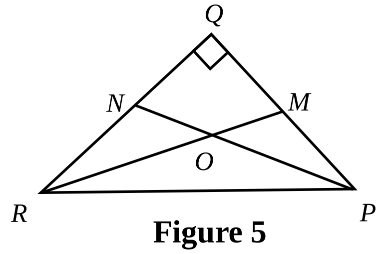


Figure 5

4. [15-16 Final Exam #13]

In **Figure 6**, AD is a perpendicular bisector of BC while BE is an altitude of ΔABC. AD and BE 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)**

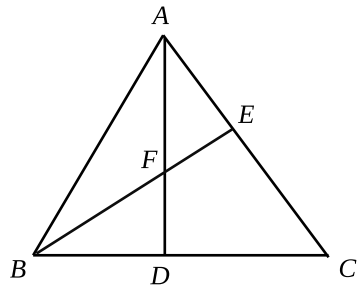


Figure 6

5. [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)

6. [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.

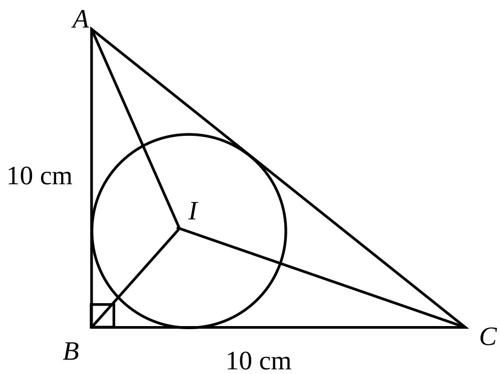


Figure 5

(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)**

7. [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)

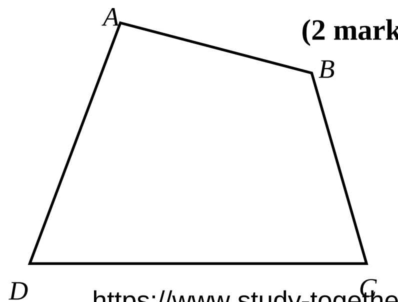


Figure 6

8. [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)**

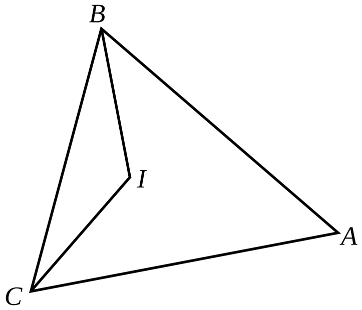


Figure 8

9. [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)

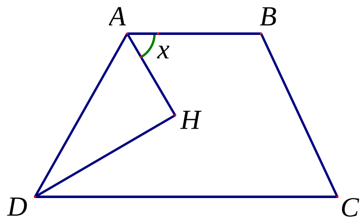


Figure 2

10. [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)**

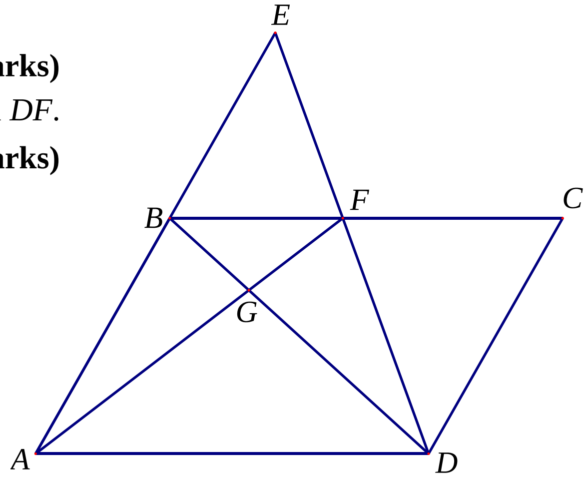


Figure 6

11. [18-19 Mid-year Exam #5]

In **Figure 2**, AC is an altitude of ΔABD while AD is the angle bisector of $\angle BAE$. It is given that $\angle ADC = 2\angle CAD$ and $\angle E = 20°$.

(a) Find $\angle B$. **(3 marks)**

(b) Determine whether ΔABE is an isosceles triangle. **(2 marks)**

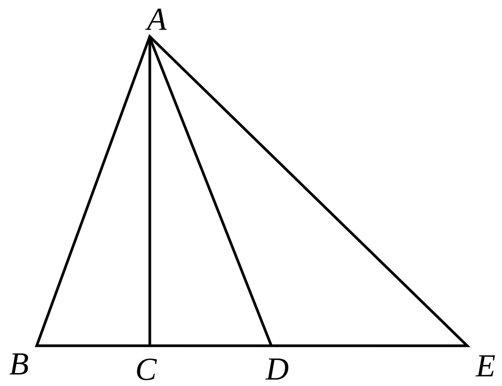
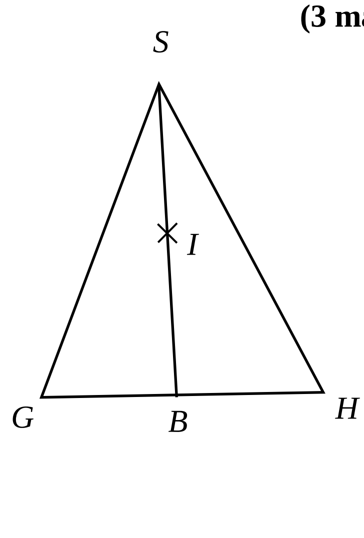


Figure 2

12. [18-19 Mid-year Exam #6]

In **Figure 3**, I is the incentre of ΔGHS. If $SG = SH$ and $\angle G = 40°$, find $\angle BSH$.

(3 marks)



13. [18-19 Mid-year Exam #12]

In **Figure 6**, *BF* is the angle bisector of $\angle ABC$. *FE* and *FD* are altitudes of ΔCFB and ΔFAB respectively.

(a) Prove that $FE = FD$. **(2 marks)**

(b) By considering the areas of ΔAFB and ΔCFB, prove that $\frac{AF}{FC} = \frac{AB}{BC}$. **(2 marks)**

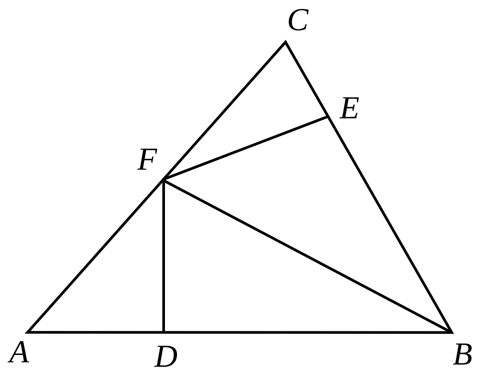


Figure 6

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