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**The Sine Rule, The Cosine Rule, Area of a Triangle**

(Gaeaf 2005)

4. The lengths of the three sides of a triangle are 8.5 cm, 6.8 cm and 9.4 cm. Find, correct to one decimal place,
- (a) the largest angle of the triangle,
- (b) the area of the triangle. [5]

(Haf 2005)

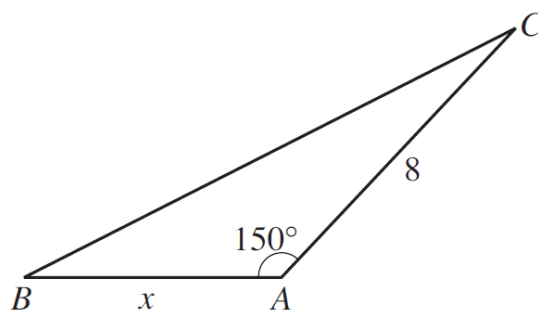
8. The triangle  $ABC$  is such that  $AB = x$  cm,  $BC = (x - 3)$  cm,  $CA = (x - 1)$  cm and  $\widehat{ABC} = 60^\circ$ .
- (a) Use the cosine rule to show that  $x = 8$ . [4]
- (b) Find the area of triangle  $ABC$ , giving your answer in surd form. [2]

(Gaeaf 2006)

3. The triangle  $ABC$  is such that  $AB = 12$  cm,  $BC = 10$  cm and  $\widehat{CAB} = 45^\circ$ .
- (a) Find the possible values of  $\widehat{BCA}$  and  $\widehat{ABC}$ . [4]
- (b) Find the possible values of the area of the triangle  $ABC$ . [2]

(Haf 2006)

3. The diagram below shows the triangle  $ABC$  with  $AB = x$  cm,  $AC = 8$  cm and  $\widehat{BAC} = 150^\circ$ .



Given that the area of the triangle  $ABC$  is  $10 \text{ cm}^2$ ,

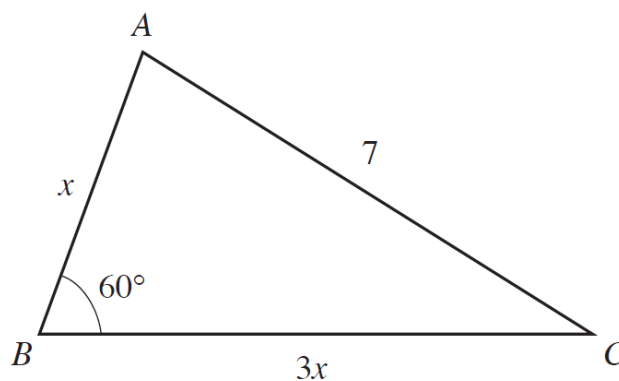
- (a) find  $x$ , [3]
- (b) calculate the length of the longest side of the triangle  $ABC$ , giving your answer correct to two decimal places. [3]

(Gaeaf 2007)

6. The triangle  $ABC$  is such that  $AB = 6$  cm,  $AC = 10$  cm and  $\hat{BAC}$  is an **obtuse** angle. The area of triangle  $ABC$  is  $15\sqrt{3}$  cm<sup>2</sup>.
- (a) Find the size of  $\hat{BAC}$ . [3]
- (b) Calculate the length of  $BC$ . [3]

(Haf 2007)

3. The diagram below shows the triangle  $ABC$  with  $AB = x$  cm,  $BC = 3x$  cm,  $AC = 7$  cm and  $\hat{ABC} = 60^\circ$ .



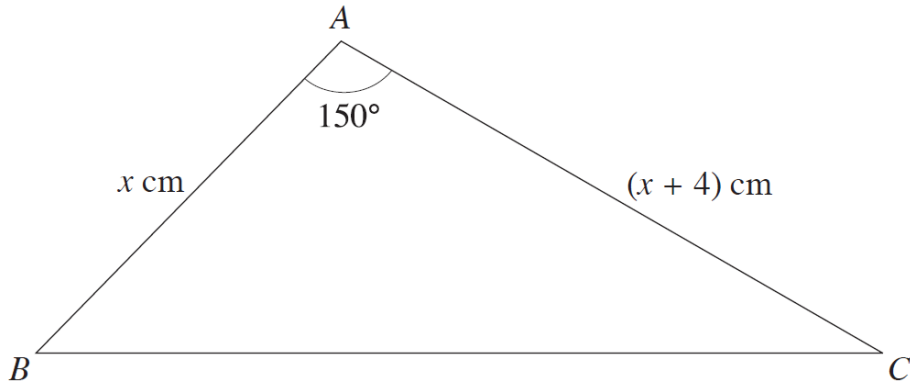
- (a) Show that  $x = \sqrt{7}$ . [3]
- (b) Find  $\hat{ACB}$ . [2]

(Gaeaf 2008)

5. In triangle  $ABC$ ,  $AB = 6$  cm,  $BC = 13$  cm and  $CA = 9$  cm.
- (a) Find the value of  $\cos \hat{BAC}$  as a fraction in its lowest terms. [3]
- (b) Show that the area of triangle  $ABC$  is  $4\sqrt{35}$  cm<sup>2</sup>. [3]

(Haf 2008)

3. The diagram below shows the triangle  $ABC$  with  $AB = x$  cm,  $AC = (x + 4)$  cm and  $\widehat{BAC} = 150^\circ$ .

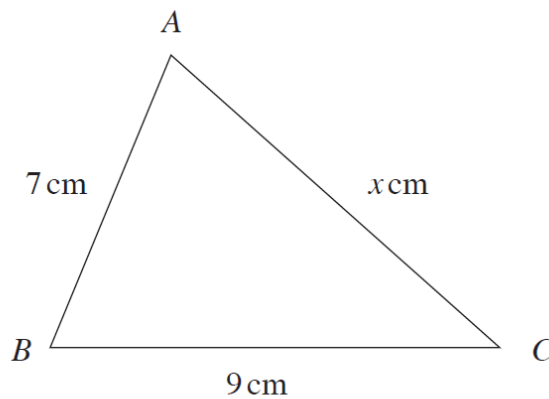


Given that the area of the triangle  $ABC$  is  $15 \text{ cm}^2$ ,

- (a) find the value of  $x$ , [3]  
(b) find the length of  $BC$  correct to one decimal place. [2]

(Gaeaf 2009)

3. The diagram below shows a sketch of the triangle  $ABC$  with  $AB = 7$  cm,  $AC = x$  cm,  $BC = 9$  cm and  $\cos \widehat{BAC} = \frac{2}{7}$ .



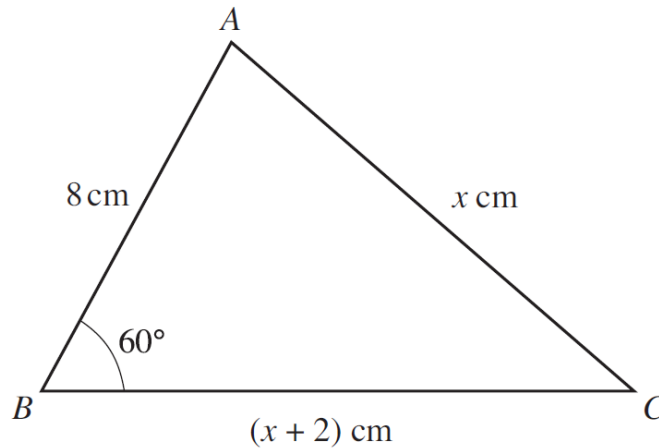
- (a) Write down and simplify a quadratic equation satisfied by  $x$ . Hence evaluate  $x$ . [3]  
(b) (i) Express  $\sin \widehat{BAC}$  in the form  $\frac{\sqrt{m}}{n}$ , where  $m, n$  are integers whose values are to be found.  
(ii) Express  $\sin \widehat{ACB}$  in the form  $\frac{\sqrt{p}}{3}$ , where  $p$  is an integer whose value is to be found. [4]

(Haf 2009)

3. The triangle  $ABC$  is such that  $AB = 16$  cm,  $AC = 9$  cm and  $\widehat{ABC} = 23^\circ$ .
- (a) Find the possible values of  $\widehat{ACB}$ . Give your answers correct to the nearest degree. [2]
- (b) Given that  $\widehat{BAC}$  is an **acute** angle, find
- (i) the size of  $\widehat{BAC}$ , giving your answer correct to the nearest degree,
- (ii) the area of triangle  $ABC$ , giving your answer correct to one decimal place. [4]

(Gaeaf 2010)

3. The diagram below shows a sketch of the triangle  $ABC$  with  $AB = 8$  cm,  $AC = x$  cm,  $BC = (x + 2)$  cm and  $\widehat{ABC} = 60^\circ$ .



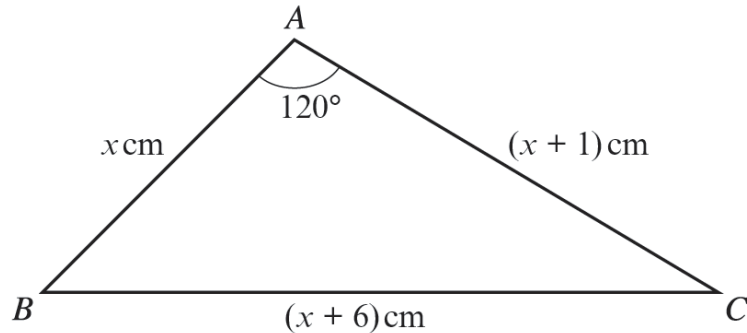
- (a) Write down and simplify an equation satisfied by  $x$ . Hence evaluate  $x$ . [3]
- (b) Find the size of  $\widehat{ACB}$ . [2]

(Haf 2010)

3. (a) The triangle  $ABC$  is such that  $AB = 11$  cm and  $\widehat{BAC} = 110^\circ$ . Given that the area of the triangle  $ABC$  is  $31$  cm<sup>2</sup>, find the length of  $BC$ . [4]
- (b) The triangle  $XYZ$  is such that  $XY = 2$  cm,  $YZ = (2\sqrt{3} - 1)$  cm and  $\widehat{YXZ} = 60^\circ$ . Find an expression for  $\sin \widehat{XZY}$  in the form  $\frac{m + \sqrt{3}}{n}$ , where  $m, n$  are integers whose values are to be found. [3]

(Gaeaf 2011)

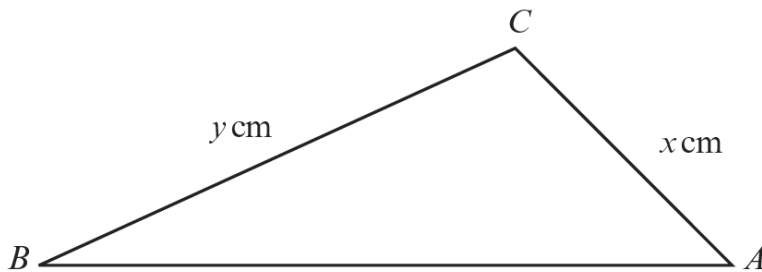
3. The diagram below shows a sketch of the triangle  $ABC$  with  $AB = x$  cm,  $AC = (x + 1)$  cm,  $BC = (x + 6)$  cm and  $\widehat{BAC} = 120^\circ$ .



- (a) Show that  $x$  satisfies the equation  $2x^2 - 9x - 35 = 0$ . Hence evaluate  $x$ . [4]
- (b) Find the area of triangle  $ABC$ . Give your answer correct to two decimal places. [2]

(Haf 2011)

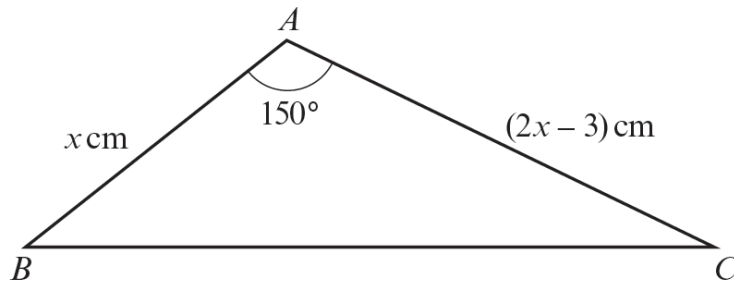
3. The diagram below shows a sketch of the triangle  $ABC$  with  $\sin A = \frac{3}{5}$ ,  $\sin B = \frac{5}{13}$ ,  $\sin C = \frac{56}{65}$ ,  $AC = x$  cm and  $BC = y$  cm.



- (a) Show that  $y = 1.56x$ . [2]
- (b) Given that the area of triangle  $ABC$  is  $4.2 \text{ cm}^2$ , find the value of  $x$  and the value of  $y$ . [5]

(Gaeaf 2012)

3. The diagram below shows a sketch of the triangle  $ABC$  with  $AB = x$  cm,  $AC = (2x - 3)$  cm and  $\widehat{BAC} = 150^\circ$ . The area of triangle  $ABC$  is  $6.75$  cm<sup>2</sup>.



- (a) Show that  $x$  satisfies the equation  $2x^2 - 3x - 27 = 0$ . Hence evaluate  $x$ . [4]

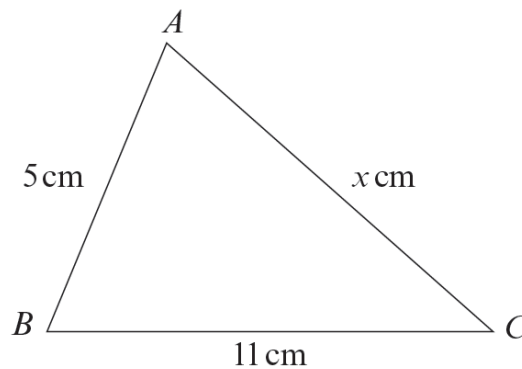
- (b) Find the length of  $BC$ . Give your answer correct to two decimal places. [2]

The point  $D$  lies on  $BC$  and is such that  $AD$  is perpendicular to  $BC$ .

- (c) Find the length of  $AD$ . Give your answer correct to two decimal places. [2]

(Haf 2012)

3. (a) The diagram below shows a sketch of the triangle  $ABC$  with  $AB = 5$  cm,  $AC = x$  cm,  $BC = 11$  cm and  $\cos \widehat{BAC} = \frac{2}{5}$ .

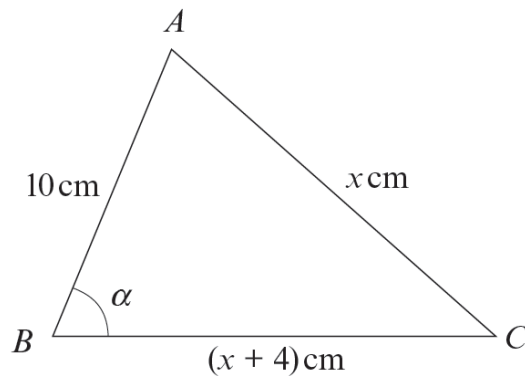


Write down and simplify a quadratic equation satisfied by  $x$ .  
Hence evaluate  $x$ . [3]

- (b) The triangle  $XYZ$  is such that  $XY = 32$  cm,  $XZ = 15$  cm and  $\widehat{XYZ} = 19^\circ$ .  
Find the possible values of  $\widehat{YXZ}$ . Give your answers correct to the nearest degree. [4]

(Gaeaf 2013)

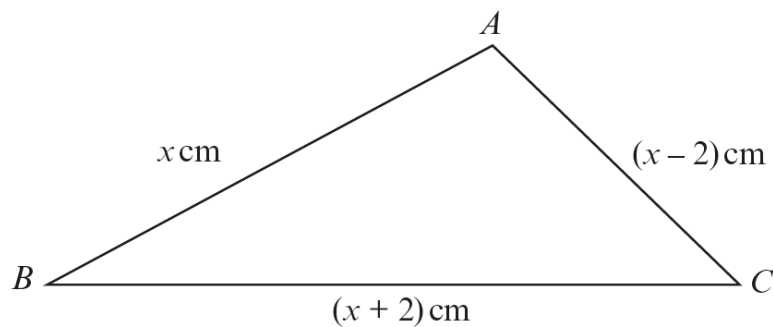
3. The diagram below shows a sketch of the triangle  $ABC$  with  $AB = 10$  cm,  $AC = x$  cm,  $BC = (x + 4)$  cm and  $\widehat{ABC} = \alpha$ , where  $\cos \alpha = \frac{3}{5}$ .



- (a) Write down and simplify an equation satisfied by  $x$ . Hence, evaluate  $x$ . [3]
- (b) Find the exact value of the area of triangle  $ABC$ . [3]

(Haf 2013)

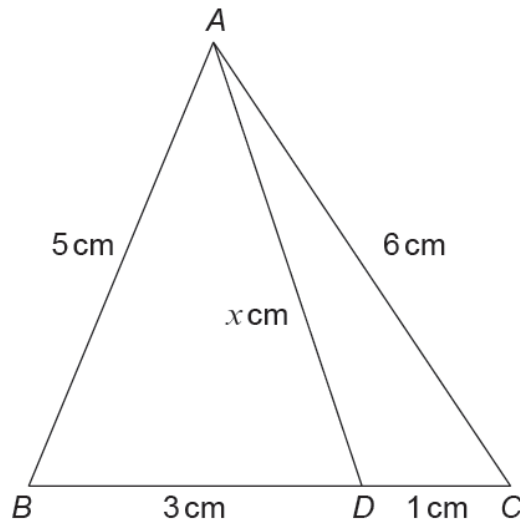
3. The diagram below shows a sketch of the triangle  $ABC$  with  $AB = x$  cm,  $AC = (x - 2)$  cm and  $BC = (x + 2)$  cm.



- (a) Show that  $\cos \widehat{BAC} = \frac{x - 8}{2x - 4}$ . [3]
- (b) Given that  $\widehat{BAC} = 120^\circ$ ,
- find the value of  $x$ ,
  - find the size of  $\widehat{ABC}$ . [4]

(Gaeaf 2014)

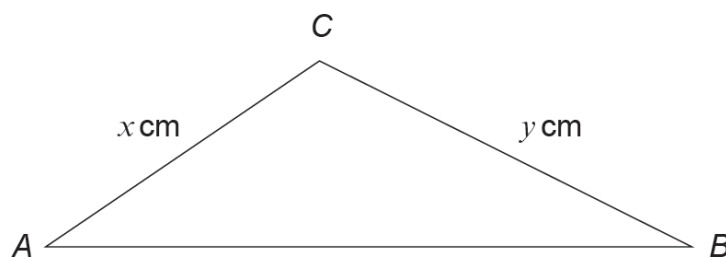
5. The diagram below shows a sketch of the triangle  $ABC$  with  $AB = 5$  cm and  $AC = 6$  cm. The point  $D$  is on  $BC$  such that  $BD = 3$  cm,  $DC = 1$  cm and  $AD = x$  cm.



- (a) (i) By applying the cosine rule in each of the triangles  $ADB$  and  $ADC$ , show that  $\cos \hat{ADB} = \frac{x^2 - 16}{6x}$  and find a similar expression for  $\cos \hat{ADC}$ .
- (ii) Noting that  $\hat{ADB}$  and  $\hat{ADC}$  are angles on a straight line, use the expressions derived in part (i) to write down an equation satisfied by  $x$ . Hence show that  $x = 5.5$ . [6]
- (b) Find the area of triangle  $ADB$ . Give your answer correct to two decimal places. [3]

(Haf 2014)

3. The diagram below shows a sketch of the triangle  $ABC$  with  $\sin A = \frac{4}{5}$ ,  $\sin B = \frac{8}{17}$ ,  $\cos C = -\frac{13}{85}$ ,  $AC = x$  cm and  $BC = y$  cm.



- (a) Show that  $y = 1.7x$ . [2]
- (b) Given that  $AB = 10.5$  cm, use the cosine rule to find the exact value of  $x$ . [4]

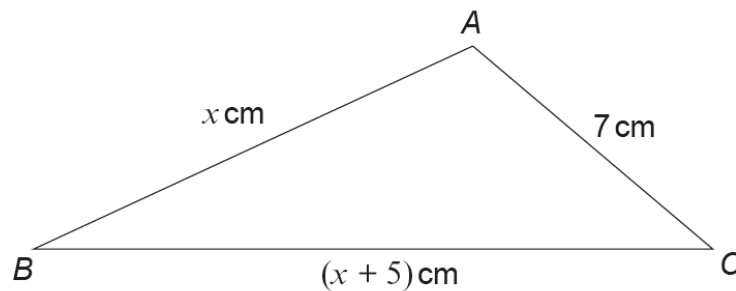


(Haf 2015)

3. The triangle  $ABC$  is such that  $AB = 19$  cm,  $AC = 12$  cm and  $\hat{ABC} = 25^\circ$ .
- (a) Find the possible values of  $\hat{ACB}$ . Give your answers correct to the nearest degree. [2]
- (b) Given that  $\hat{BAC}$  is an **acute** angle, find
- (i) the size of  $\hat{BAC}$ , giving your answer correct to the nearest degree,
- (ii) the area of triangle  $ABC$ , giving your answer correct to two decimal places. [4]

(Haf 2016)

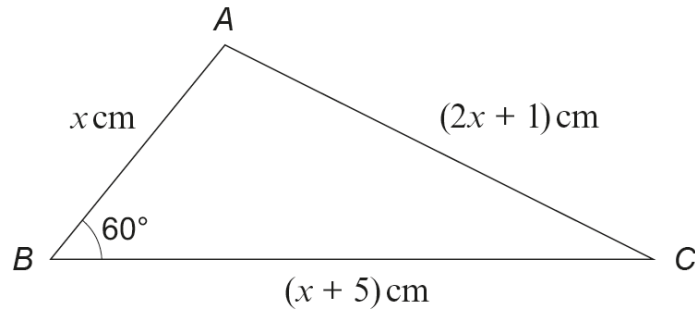
3. The diagram below shows a sketch of the triangle  $ABC$  with  $AB = x$  cm,  $BC = (x + 5)$  cm,  $AC = 7$  cm and  $\cos \hat{BAC} = -\frac{3}{5}$ .



- (a) Write down an equation satisfied by  $x$ . Hence show that  $x = 15$ . [3]
- (b) Find the exact value of the area of triangle  $ABC$ . [3]
- (c) The point  $D$  lies on  $BC$  and is such that  $AD$  is perpendicular to  $BC$ . Find the length of  $AD$ . [2]

(Haf 2017)

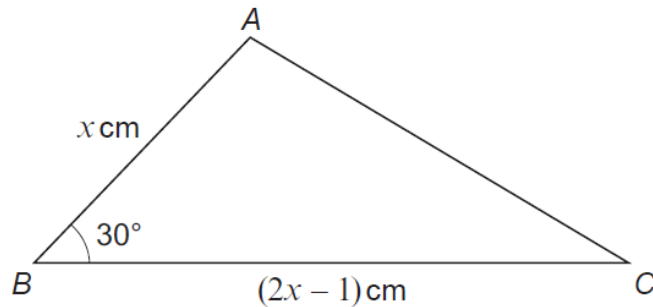
3. The diagram below shows a sketch of the triangle  $ABC$  with  $AB = x$  cm,  $BC = (x + 5)$  cm,  $AC = (2x + 1)$  cm and  $\hat{A}BC = 60^\circ$ .



- (a) Show that  $x$  satisfies the equation  $3x^2 - x - 24 = 0$ . Hence evaluate  $x$ . [4]
- (b) Find the size of  $\hat{A}CB$ . [2]

(Haf 2018)

3. (a) The diagram below shows a sketch of the triangle  $ABC$  with  $AB = x$  cm,  $BC = (2x - 1)$  cm and  $\hat{A}BC = 30^\circ$ . The area of triangle  $ABC$  is  $11.25$  cm<sup>2</sup>.



- (i) Write down and simplify a quadratic equation satisfied by  $x$ . Hence show that  $x = 5$ . [6]
- (ii) Find the length of  $AC$ . Give your answer correct to one decimal place. [6]
- (b) The triangle  $XYZ$  is such that  $XY = 29$  cm,  $XZ = 16$  cm and  $\hat{X}YZ = 17^\circ$ . Find the possible values of  $\hat{YXZ}$ . Give your answers correct to the nearest degree. [4]