

**Mathematical Formulae***Compound interest*

$$\text{Total amount} = P \left(1 + \frac{r}{100}\right)^n$$

*Mensuration*

$$\text{Curved surface area of a cone} = \pi r l$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a cone} = \frac{1}{3} \pi r^2 h$$

$$\text{Volume of a sphere} = \frac{4}{3} \pi r^3$$

$$\text{Area of triangle ABC} = \frac{1}{2} bc \sin A$$

$$\text{Arc length} = r\theta, \text{ where } \theta \text{ is in radians}$$

$$\text{Sector area} = \frac{1}{2} r^2 \theta, \text{ where } \theta \text{ is in radians}$$

*Trigonometry*

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

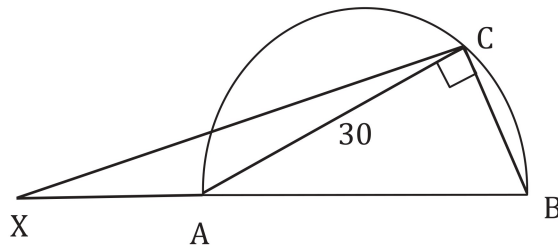
*Statistics*

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f}$$

$$\text{Standard deviation} = \sqrt{\frac{\Sigma fx^2}{\Sigma f} - \left(\frac{\Sigma fx}{\Sigma f}\right)^2}$$

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- 18** The diagram shows a semicircle of radius 17cm.  
 $C$  is a point on the semicircle with diameter  $AB$  such that  
 $AC = 30$  cm and  $\angle ACB = 90^\circ$ .  
 $BA$  is produced to  $X$  such that  $XA : XB = 1 : 3$ .



- (a) Express as a fraction in its simplest form,  
 (i)  $\tan \angle ABC$ ,

*Answer* (a)  $\tan \angle ABC = \dots\dots\dots$  [2]

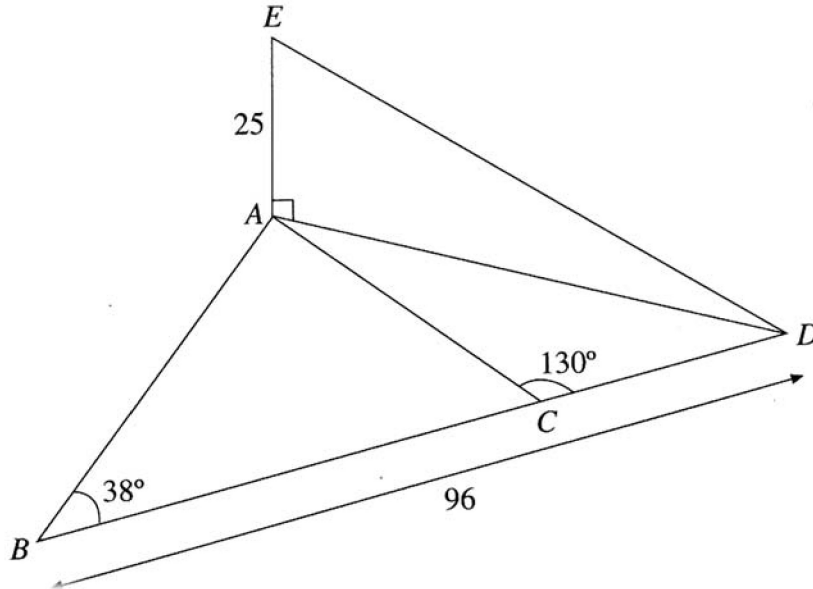
- (ii)  $\sin \angle XAC$ ,

*Answer* (b)  $\sin \angle XAC = \dots\dots\dots$  [1]

- (b) Calculate the area of triangle  $ACX$ .

*Answer* (c)  $\dots\dots\dots \text{cm}^2$  [2]

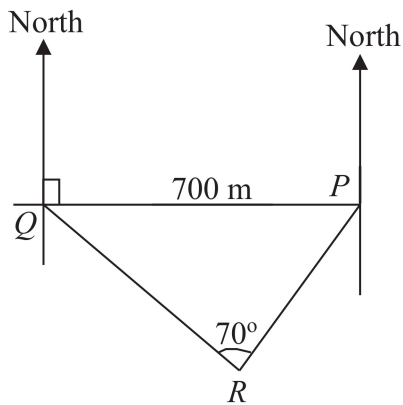
7. In the diagram,  $ABD$  represents a horizontal triangular field.  $C$  is a point on  $BD$  such that  $BC : CD = 2 : 1$ .  $AE$  represents a flagpole which is 25 m high.  $BD = 96$  m,  $\angle ABC = 38^\circ$  and  $\angle ACD = 130^\circ$ .



Calculate

- (a)  $AC$ , [3]  
 (b)  $AD$ , [3]  
 (c) the angle of depression of  $D$  from  $E$ , [2]  
 (d) the shortest distance from  $A$  to  $BD$ . [3]  
 (e) the greatest angle of elevation of the top of the flagpole when viewed from a point along  $BD$ . [2]

- 18 In the diagram shown below,  $P$  is due east of  $Q$  and  $\angle PRQ = 70^\circ$ . The bearing of  $R$  from  $P$  is  $220^\circ$  and  $PQ = 700$  m.



Find

- (a)  $\angle QPR$ ,

*Answer (a)* ..... [1]

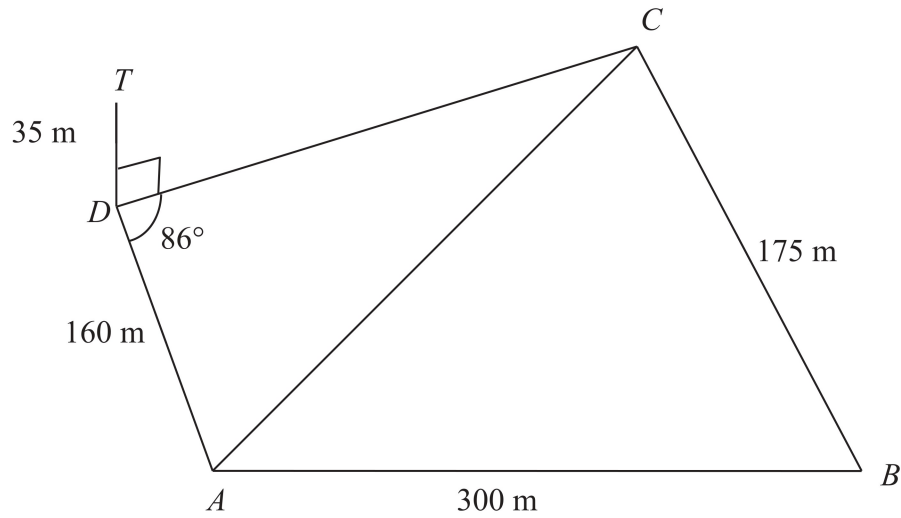
- (b) the bearing of  $R$  from  $Q$ ,

*Answer (b)* ..... [2]

- (c) the bearing of  $P$  from  $R$ .

*Answer (c)* ..... [1]

- 9  $A, B, C$  and  $D$  are four points on level ground.  $B$  is due east of  $A$ ,  $AB = 300$  m,  $AD = 160$  m,  $\angle ADC = 86^\circ$ ,  $BC = 175$  m and the bearing of  $C$  from  $B$  is  $336^\circ$ .  $DT$  is a vertical tower of height 35 m.

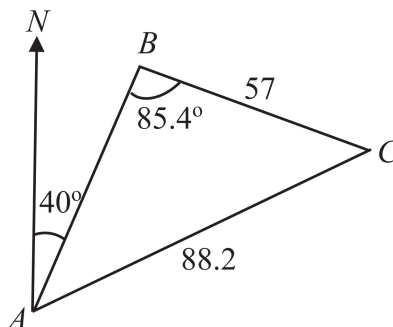


- (a) Prove that  $\angle ABC$  is  $66^\circ$ . [1]

Calculate

- (b) the length of  $AC$ , [3]  
 (c)  $\angle DAC$ , [2]  
 (d) the area of triangle  $ADC$ , [2]  
 (e) the shortest distance of  $D$  from  $AC$ , [2]  
 (f) the greatest angle of elevation of  $T$  from a point along  $AC$ . [2]

- 14  $ABC$  is a triangular field on level horizontal ground.  
 $AC = 88.2$  km,  $BC = 57$  km and the bearing of  $B$  from  $A$  is  $040^\circ$ .



- (a) Calculate angle  $BAC$ .

Answer ..... ° [2]

- (b) Find the bearing of  $C$  from  $A$ .

Answer ..... ° [1]

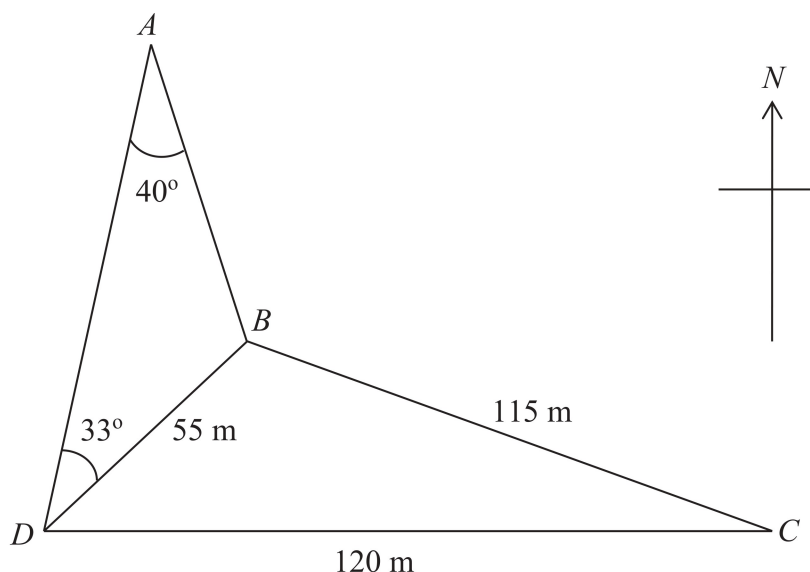
- (c) Calculate the area of the field.

Answer .....  $\text{km}^2$  [2]

- (d) Find the shortest distance from  $B$  to line  $AC$ .

Answer ..... km [1]

- 5 The diagram below shows 4 points  $A, B, C$  and  $D$  on level ground where  $D$  is due west of  $C$ .



- (a) Given that  $CD = 120$  m,  $BC = 115$  m,  $BD = 55$  m,  $\hat{BAD} = 40^\circ$  and  $\hat{ADB} = 33^\circ$ , find
- (i)  $AB$ , [2]
  - (ii)  $\hat{BDC}$ , [3]
  - (iii) the bearing of  $B$  from  $C$ . [3]
- (b) A tower stands at  $B$  such that the angle of elevation of the top of the tower from  $D$  is  $70^\circ$ .  
Find
- (i) the height of the tower, leaving your answer to 2 decimal places. [2]
  - (ii) the greatest possible angle of elevation of the top of the tower from a point on  $DC$ . [2]

- 6 Mr Tan paid \$40 for  $x$  litres of petrol in Singapore.

- (a) Write down an expression, in terms of  $x$ , for the price in dollars, of each litre of petrol in Singapore. [1]

He travelled to Malaysia over the weekend and found out that he can get an extra 5 litres of petrol for \$40.

- (b) Write down an expression, in terms of  $x$ , for the price in dollars, of each litre of petrol in Malaysia. [1]
- (c) Given that petrol in Malaysia is cheaper by 40 cents per litre than petrol in Singapore, form an equation, in terms of  $x$ , to represent the information and show that it simplifies to  $x^2 + 5x - 500 = 0$ . [3]