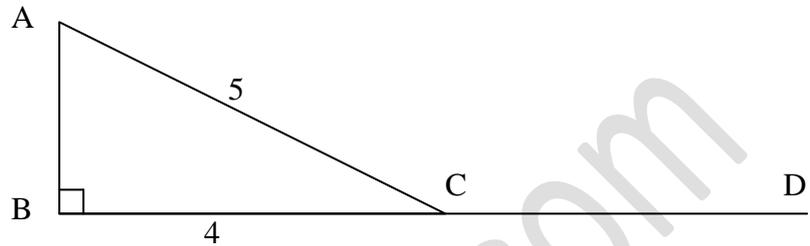# Topic 17: Trigonometry I

1. Angle $A\hat{B}C = 90^o$, AC = 5 cm, BC = 4 cm and BCD is a straight line.

   Calculate

   i. AB,

   ii. $\sin A\hat{C}B$,

   iii. $\cos A\hat{C}D$.

2. In the triangle GHK, GH = 2 cm, HK = 5 cm and KG = 4 cm Calculate the value of $\cos \angle K$, giving your answer as a fraction.
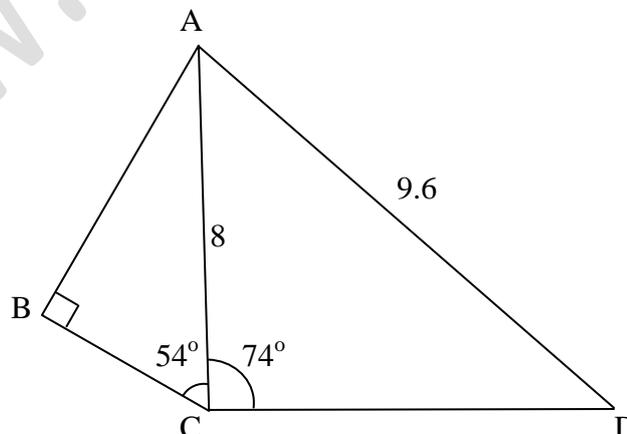
3. PQR is a triangular region in which PQ = 5 km, $\angle PQR$ = 36 ^{o} and QR = 6 km. Calculate

   i. PR,
   ii.   the area of the region, expressing your answer in hectares, correct to the nearest hectare,
         [1 km^2 = 100 hectares]

4. a.   In the diagram, AC = 8 cm, AD = 9.6 cm, $\angle ABC$ = 90°, $\angle ACB$ = 54° and $\angle ACD = 74^o$.
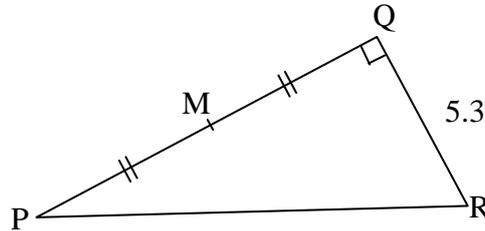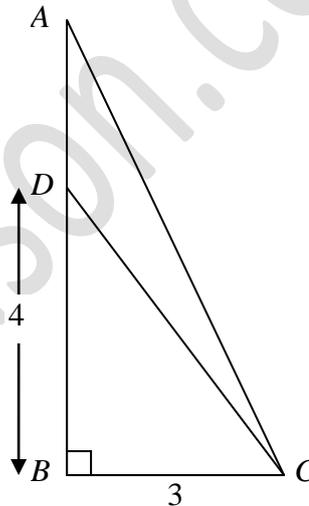
   Calculate

   i. AB,
   ii. $\angle ADC$

b. In the triangle *PQR*, *M* is the midpoint of *PQ*. Given that *QR* =5.3cm, $\angle PQR$ =90° and $\angle QRP$ is 56°. Calculate $\angle MRQ$.

5. In the diagram, $\angle ABC = 90^{o}$, *BC*=3 cm and *D* is the point on *AB* such that *DB* = 4 cm.
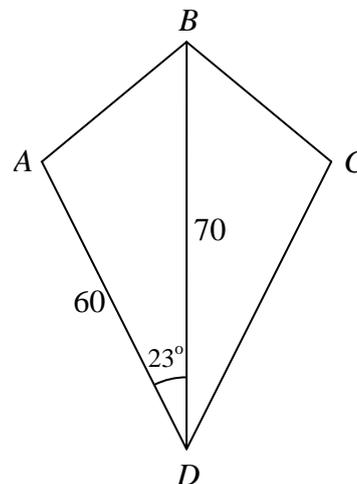
   i.   Calculate *CD*.

   ii. Write down, as a fraction, the value of tan $\angle BDC$.

   iii. Given also that $AD = \dfrac{1}{2} BD$, calculate the area of ΔADC.

6. The quadrilateral *ABCD* represents a kite which is symmetrical about the line *BD*. Given that *AD* = 60 cm, *BD* = 70 cm and $\angle ADB = 23^{o}$.

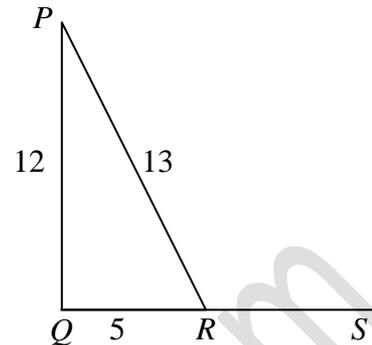   Calculate

   i.   *AB*,
   ii. *AC*.

7. In the diagram, *QRS* is a straight line. *PQ* = 12 m, *QR* = 5 m and *RP* = 13 m.

   a. Explain why $\angle PQR$ is a right angle.

   b. Expressing your answer as a fraction,

   Write down
   i.   tan $\angle QPR$,
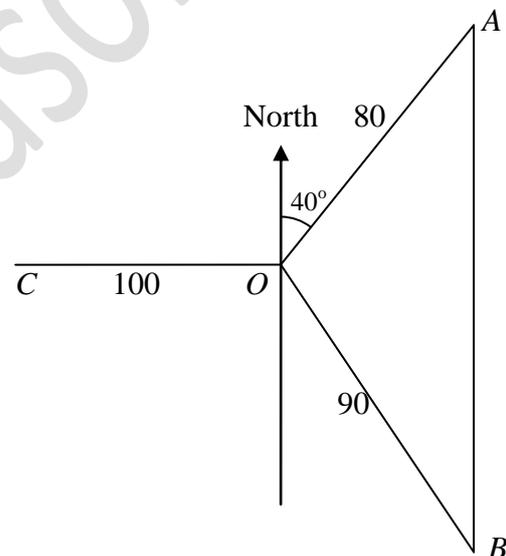   ii.   cos $\angle PRS$.

8. a. A surveyor is carrying out a survey on horizontal ground.

   From a point *O* she observes a point *A* which is 80 m from *O* on a bearing 040°,

   The surveyor also observes a point *B* which is 90 m from *O* and due south of the point *A*.

   Calculate

   i.   the bearing of *O* from *A*,
   ii.   the angle *OBA*,
   iii. *AB*.

   b. The point *C* is 100 m due west of *O*.

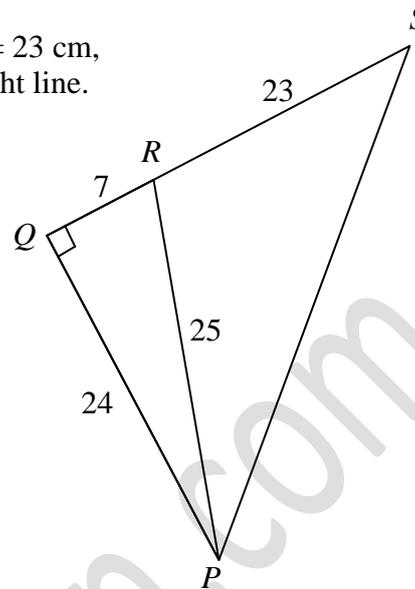   The surveyor walks directly from *C* to *A*. How far does she walk?

   c. The surveyor then walks from *A* towards *B* until she reaches a point *P*, where *CP* is a minimum. Calculate *CP*.

9. In the diagram, PQ = 24 cm, QR = 7 cm, RS = 23 cm, PR =25 cm, $\angle PQR = 90°$ and QRS is a straight line.
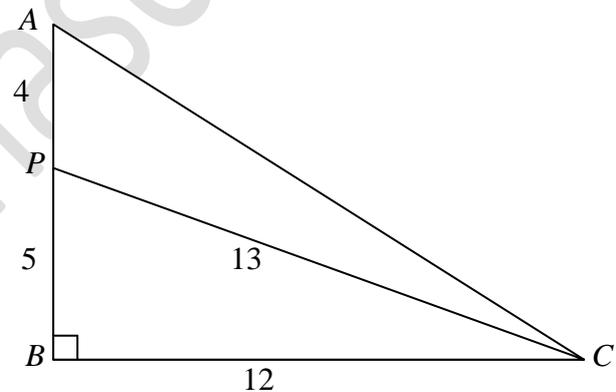
    Giving each answer as a fraction, find

    i.   sin $\angle QPR$,
    ii.   tan $\angle QSP$,
    iii. cos $\angle PRS$,

10. In the right angled triangle ABC, P is a point on the side AB. Given that AP = 4cm, PB = 5 cm, BC =12 cm and PC =13cm,
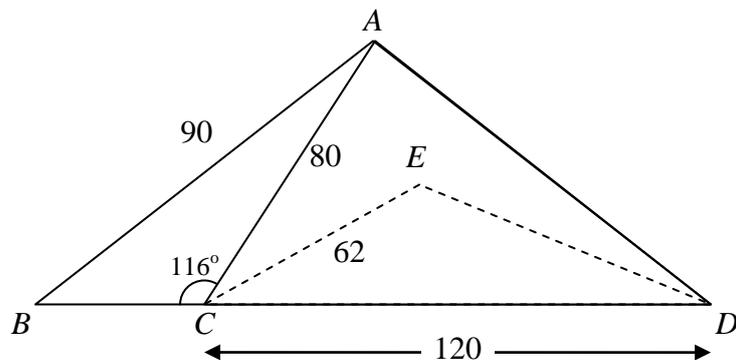
    Calculate

    i. AC,
    ii.   cos $\angle BPC$,
    iii. tan $\angle PAC$,
    iv.   sin $\angle APC$.

11. In the diagram, BCD is a straight line. AB = 90 m, AC = 80 m, CD = 120 m and $\angle BCA = 116°$.

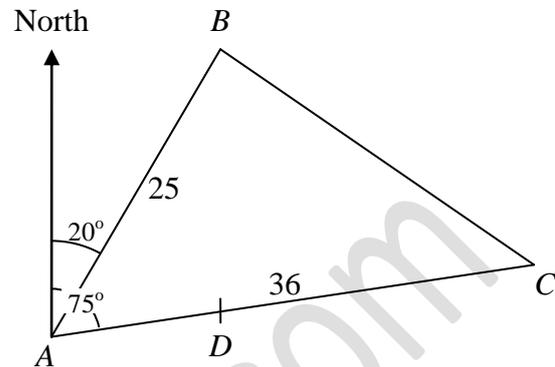   a. Calculate
        i $\angle BAC$,
        ii. AD.

    b. The point E, inside triangle ACD, is such that CE = 62 m and the area of triangle CDE is 2200 m^2. Calculate $\angle ECD$.

Elementary Mathematics Tutorial

12.   In the diagram, *A*, *B* and *C* represent three islands.

B is 25 km from *A* on a bearing of 020°,

C is 36 km from *A* on a bearing of 075°.

a.   Calculate the bearing of *A* from *B*.

b.   Calculate the distance of *C* from *B*.

c.   A ship leaves *A* at 12 40 and sails directly to *C* at a steady speed of 20 km/h.

      i.   When the ship is at *D*, it is due south of *B*. Calculate the distance *AD*.
     ii.   Find the time to the nearest minute at which the ship is closest to *B*.

13.   Ann stands at *A*, which is at the top of a vertical cliff *AC*. She sees a boat on a lake at *B*, which is 80 m from *C*. The angle of depression of *B* from *A* is 35°.
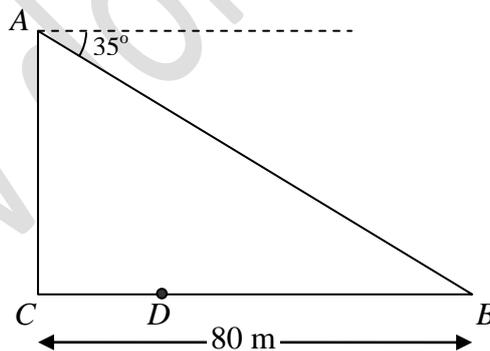
a.   Using as much of the information given below as is necessary, calculate the height of the cliff.

b.   A yacht is on the lake at *D*, where *CDB* is a straight line.

The angle of elevation of *A* from *D* is 55°. Calculate the distance *BD*.

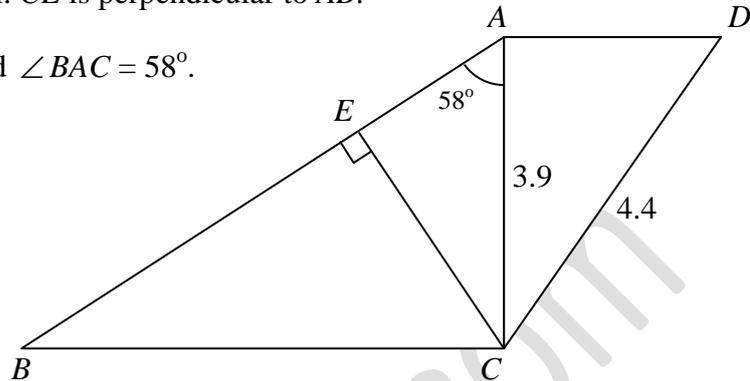[$\sin 35^o = 0.574$, $\cos 35^o = 0.819$, $\tan 35^o = 0.700$]

14. *AB*, *BC*, *CD*, *AD*, *AC* and *CE* are some of the beams supporting a roof. *AD* and *BC* are horizontal and *AC* is vertical. *CE* is perpendicular to *AB*.

$AC = 3.9$ m, $CD = 4.4$ m and $\angle BAC = 58^{o}$.

Calculate

a. the length of *CE*,

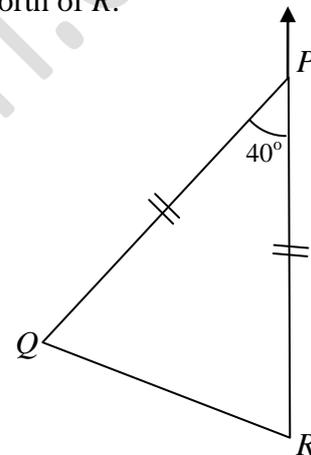b. the length of *AB*,

c. $\angle ACD$.

15. *P*, *Q* and *R* are three points on level ground with *P* due north of *R*.

Angle $QPR = 40^{o}$ and $PQ = PR$,

Calculate the bearing of
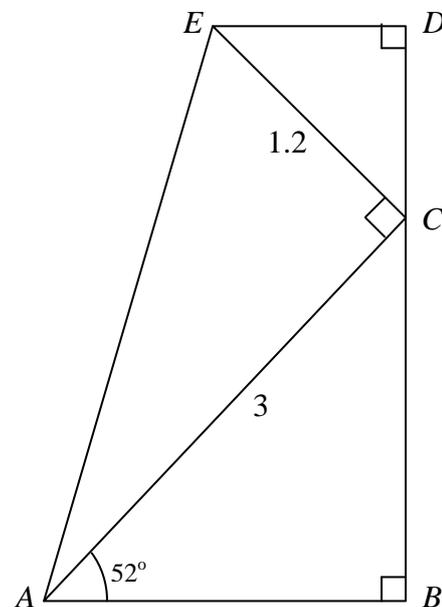
a. *Q* from *P*,

b. *P* from *Q*,

c. *Q* from *R*.

16. a. The diagram represents a frame work.

Given that $\angle BAC = 52^{o}$,
$\angle ABC = \angle CDE = \angle ACE = 90^{o}$,
$AC = 3$ m and $EC = 1.2$ m.

Calculate

i. *BC*,

ii. $\angle EAC$,

iii. *CD*.

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b. *QR* is a diameter of a circle, centre *O*, and *P* is a point on its circumference,
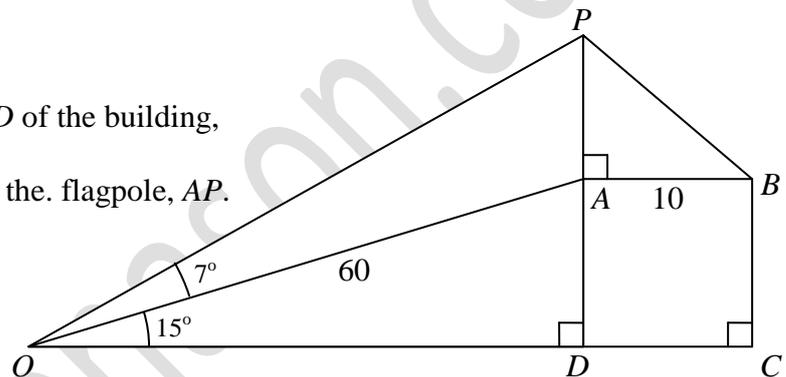
Given that $\angle PQR = 25^{o}$, calculate

i. $\angle POR$,

ii. $\angle OPR$.

iii. the value, correct to 2 significant figures, of $\dfrac{PR}{QR}$

17. *ABCD* represents a building with a vertical flagpole *AP* on the roof. The point *O* is on the same level as *C* and *D*. The angle of elevation of *A* from *O* is 15°, *OA* = 60 metres and $\angle POA = 7°$,
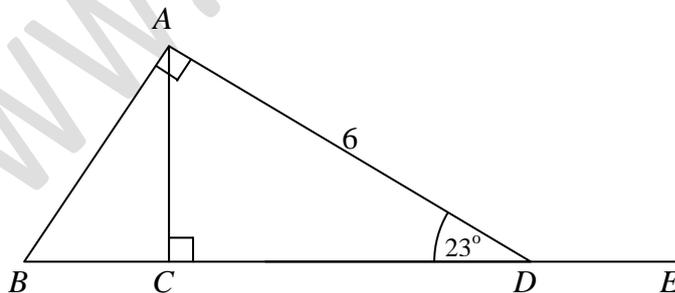
a. Calculate

i. the height *AD* of the building,

ii. the height of the. flagpole, *AP*.

b. Given also that *AB* =10 metres, calculate the angle of elevation of *P* from *B*.

18. In the diagram, $\angle BAD = \angle ACD = 90°$, $\angle ADB = 23°$, *AD* = 6 cm and *BCDE* is a straight line.

Using as much of the information given below as is necessary, calculate
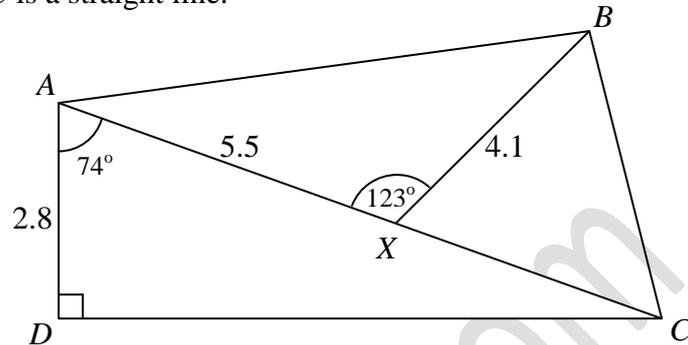
i. *AC*,

ii. *CD*,

iii. *AB*,

iv. sin $\angle ADE$.

[sin 23° = 0.391; cos 23° = 0.921; tan 23° = 0.424]

19. In the diagram, AD = 2.8 cm, AX = 5.5 cm and BX = 4.1 cm. $\angle ADC$ = 90°, $\angle DAX$ = 74°, $\angle AXB$ = 123° and AXC is a straight line.

   a. Calculate

      i. AC,
      ii. AB.

   b. Given that Y is the point on AX such that DY is parallel to XB, calculate AY.

20. Villages B and C are each 5 kilometres from village A, and $\angle BAC$ = 150°. The village C is due south of a point X and the villages A and B are both due east of X.
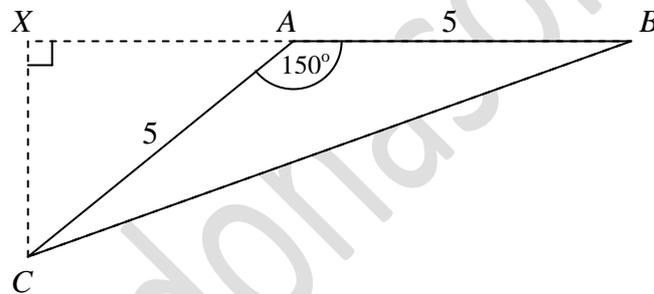
   a. Calculate the bearing of C from A.
   b. Calculate the bearing of B from C.
   c. Using as much of the information given below as is necessary, calculate
      i. how far C is west of A,
      ii. the area of he triangle ABC.

   [sin 30° = 0.5; cos 30° = 0.8660; tan 30° = 0.5774]

~End~