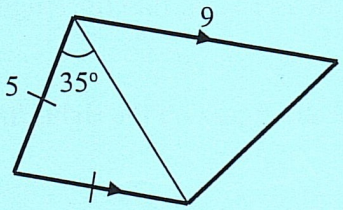
Hwa Chong Institution 华侨中学
Mathematics (SMTP)

Name: Wan Kin Hon (27) Class: 3I1 Date: 27thAug

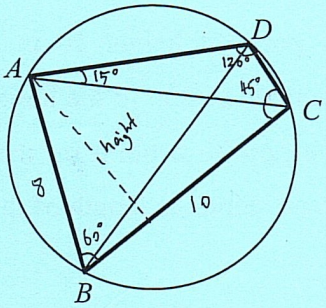
MA304.3.E1 – Sine and Cosine Rule Exercise

1. Given that the area of a rhombus is 60 m^2 and that each side is of length 12 m, find the angles of the corners of the rhombus.

2. Find the area of the quadrilateral shown on the right.

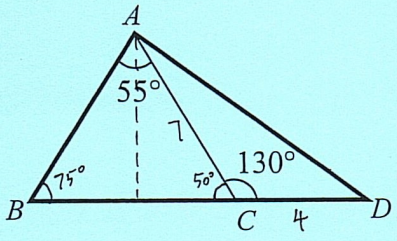


3. In a cyclic quadrilateral $ABCD$, $\angle ACD = 45°$, $\angle ADC = 120°$, $AB = 8$ cm and $BC = 10$ cm.
   (a) Find the area of triangle ABC.
   (b) Using triangle BAD or BCD, find the length of BD.

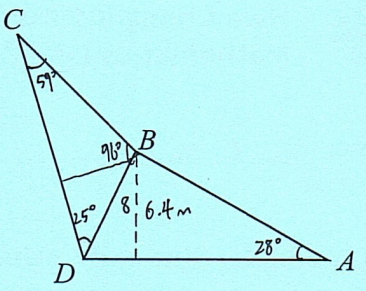


4. In triangle ABC, $\angle A = 50°$, $\angle B = 75°$ and $AB = 6.3$. What is the length of the shortest side?

5. In the figure on the right, it is given that the length of AC is 7 cm and that of CD is 4 cm. Find
   (a) the area of triangle ABD,
   (b) the distance of A from BC.



6. The figure on the right shows one side of a roof structure in which the base AD is horizontal and $BD =$ 8 m, $\angle BAD = 28°$, $\angle CDB = 25°$ and $\angle CBD = 96°$. If B is at a height of 6.4 m above AD, find



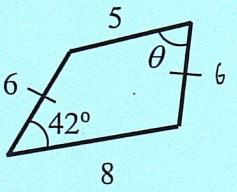
(a) AD,

(b) CD,

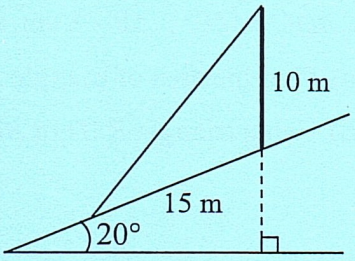
(c) the distance of B from CD.

7. The angles A and B of triangle ABC are $48°$ and $53°$ respectively. Given that the shortest side is 14 cm, find the length of the shortest altitude of the triangle.

8. In the figure on the right, find the value of θ.



9. A pole, of height 10 m, stands on a slope which is inclined at $20°$ to the horizontal. A rope joins the top of the pole to a point on the slope which is 15 m down slope. Find the length of this rope.



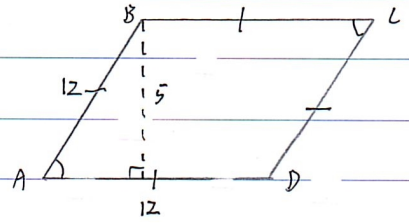
華僑中學
HWA CHONG INSTITUTION

B+

NAME _____ SUBJECT _____ MARKS _____

INDEX NO. _____ CLASS _____ DATE _____

1.



Height of rhombus ABCD = 60 ÷ 12 cm

= 5 cm

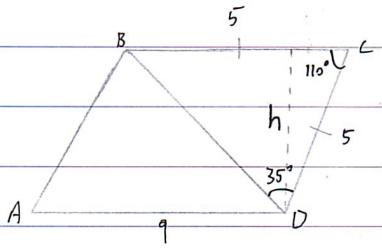
$\angle BAD = \angle BCD = \sin^{-1}\left(\frac{5}{12}\right)$

= 24.6° (3 s.f.)

$\angle ABC = \angle ADC = 90° - 24.6° + 90°$

= 155.4° (3 s.f.)

2.



$\angle BCD = 180° - 2 \times \angle BDC$

$= 180° - 2 \times 35°$

$= 110°$

$\sin(110°) = \frac{h}{5}$

$h = 5\sin(110°)$ cm

Area of quadrilateral $= \frac{1}{2}(5+9)(5\sin(110°))$ cm²

= 32.9 cm² (3 s.f.)

3. $\angle ABC = 180° - \angle ADC$ (opposite angle in cyclic quad)

$= 180° - 120°$

$= 60°$

Height of $\triangle ABC = 8\sin(60°)$ cm

Area of $\triangle ABC = \frac{1}{2}(8\sin(60°))10$ cm²

= 34.6 cm² (3 s.f.)

$AC^2 = 8^2 + 10^2 - 160\cos(60°)$ cm^2 cm^2 cm^2

$= 84$ cm^2

$AC = \sqrt{84}$ cm

$\frac{\sqrt{84}}{\sin(60°)} = \frac{8}{\sin(\angle ACB)}$

$\sin(\angle ACB) = \frac{8\sin(60°)}{\sqrt{84}}$

$\angle ACB = \sin^{-1}\left(\frac{2\sqrt{3}}{\sqrt{21}}\right)$

$\angle DAC = 180° - \angle ADC - \angle DCA$

$= 15°$

$\frac{CD}{\sin(15°)} = \frac{\sqrt{84}}{\sin(120°)}$ cm cm

$CD = \frac{\sqrt{84}\sin(15°)}{\sin(120°)}$ cm cm

$BD^2 = CD^2 + BC^2 - 2\cdot CD\cdot BC\cdot\cos(\angle BCD)$

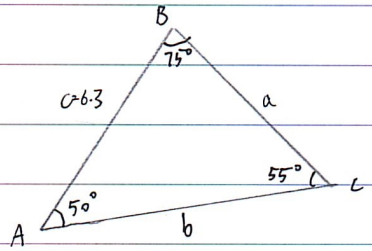
$= \left(\frac{\sqrt{84}\sin(15°)}{\sin(120°)}\right)^2 + 10^2 - 2\left(\frac{\sqrt{84}\sin(15°)}{\sin(120°)}\right)10\cdot\cos\left(45° + \sin^{-1}\left(\frac{2\sqrt{3}}{\sqrt{21}}\right)\right)$ cm^2 cm^2

$= 111.4256$ (4 d.p.) cm^2 cm^2

$BD = \sqrt{111.4256}$ cm

$= 10.6$ cm (3 s.f.)

4.



$\angle C = 180° - \angle A - \angle B$

$= 55°$

BC is the shortest side as $\frac{\sin(50°)}{BC} = \frac{\sin(55°)}{AB} = \frac{\sin(75°)}{AC}$, as $\sin(x)$ increases when x increases, where $x < 90°$.

Thus BC is the shortest side.

$\frac{BC}{\sin(50°)} = \frac{6.3}{\sin(55°)}$

$BC = 5.89$ cm (3 s.f.)

units

華僑中學
HWA CHONG INSTITUTION

NAME _____ SUBJECT _____ MARKS _____

INDEX NO. _____ CLASS _____ DATE _____

5. (a) $\angle ALB = 180° - 130°$

$= 50°$

Height of $\triangle ABD = 7\sin(50°)$

$\angle ABC = 180° - 55° - 50°$

$= 75°$

$\frac{7}{\sin(75°)} = \frac{BL}{\sin(55°)}$

$BL = \frac{7\sin(55°)}{\sin(75°)}$ cm

Area of $\triangle ABD = \left(\frac{7\sin(55°)}{\sin(75°)} + 4\right)\left(7\sin(50°)\right) \times \frac{1}{2}$ cm^2

$= 26.6\ cm^2$ (3 s.f.)

(b) Distance of A from BL = height of $\triangle ABD$

$= 7\sin(50°)$ cm

$= 5.36$ cm (3 s.f.)

6. (a) $\angle BDA = \sin^{-1}\left(\frac{6.4}{8}\right)$

$\angle DBA = 180° - 28° - \sin^{-1}\left(\frac{6.4}{8}\right)°$

$= 152° - \sin^{-1}\left(\frac{6.4}{8}\right)°$

$\frac{AD}{\sin(152° - \sin^{-1}(\frac{6.4}{8}))} = \frac{8}{\sin(28°)}$ cm

$AD = 16.8$ cm (3 s.f.)

(b) $\angle DCB = 180° - 25° - 96°$

$= 59°$

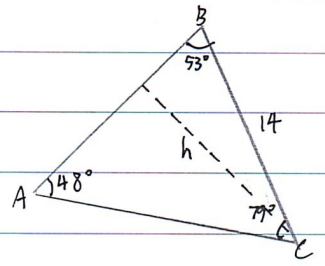
$\frac{8}{\sin(59°)} = \frac{CD}{\sin(96°)}$

$CD = 9.28$ cm (3 s.f.)

(c) Distance of B from CD $= 8\sin(25°)$ cm

$= 3.38$ cm (3 s.f.)

7.



$\angle C = 180° - 48° - 53°$

$= 79°$

AB is the longest side as the opposite angle C, is the largest angle.

Thus, the height of base AB is the shortest.

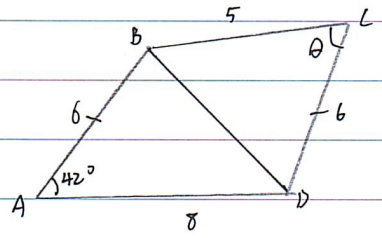
Let the height be h.

$\sin(53°) = \frac{h}{14}$ cm

Height of $\triangle ABC = 14 \sin(53°)$ cm

$= 11.2$ cm (3 s.f.)

8.



$\sqrt{6^2 + 8^2 - 96\cos(42°)} = \sqrt{5^2 + 6^2 - 60\cos(\theta)}$

$100 - 96\cos(42°) = 61 - 60\cos(\theta)$

$60\cos(\theta) = 96\cos(42°) - 39$

$\theta = \cos^{-1}\left(\frac{96\cos(42°) - 39}{60}\right)°$

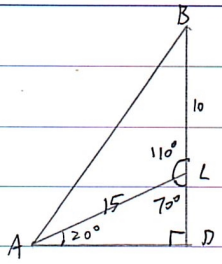
$= 57.4°$ (1 d.p.)

華僑中學
HWA CHONG INSTITUTION

NAME _____ SUBJECT _____ MARKS _____

INDEX NO. _____ CLASS _____ DATE _____

9.



$\angle ACD = 90° - 20°$

$= 70°$

$\angle ALB = 180° - 70°$

$= 110°$

$AB^2 = 15^2 + 10^2 - 300\cos(110°)$ cm²

$AB = \sqrt{325 - 300\cos(110°)}$ cm

$= 20.7$ cm (3 s.f.)

1/9/17