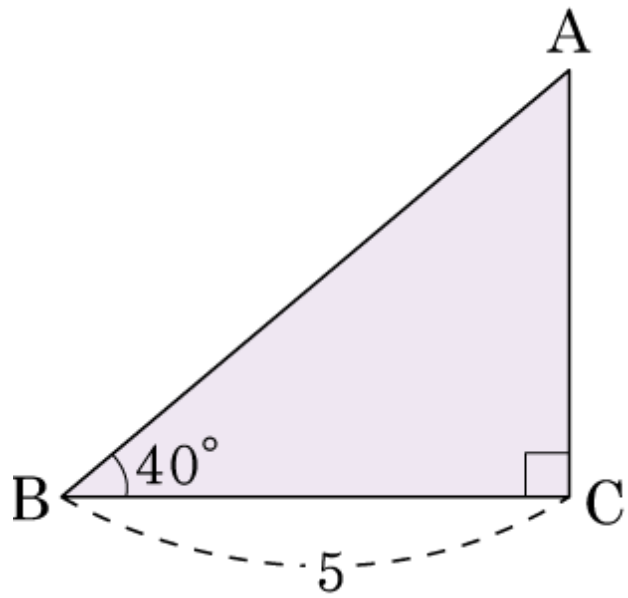
1. 다음 그림과 같이 $\angle C = 90°$ 인 직각삼각형 ABC 에서 $\overline{AC}$ 의 길이를 구하는 식은?



① $5\sin 40°$ ② $5\cos 40°$

③ $5\tan 40°$ ④ $\dfrac{5}{\tan 40°}$

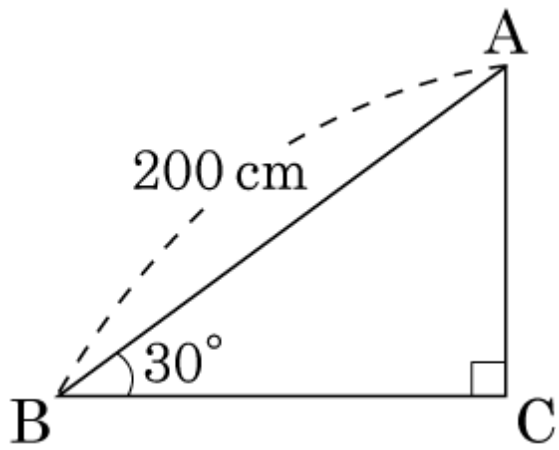
⑤ $\dfrac{\sin 40°}{5}$

해설

$\dfrac{\overline{AC}}{\overline{BC}} \times \overline{BC} = \overline{AC}$ 이므로

$\therefore\ 5\tan 40°$

2. 다음 그림에서 $\overline{AC}$ 의 길이를 구하여라.



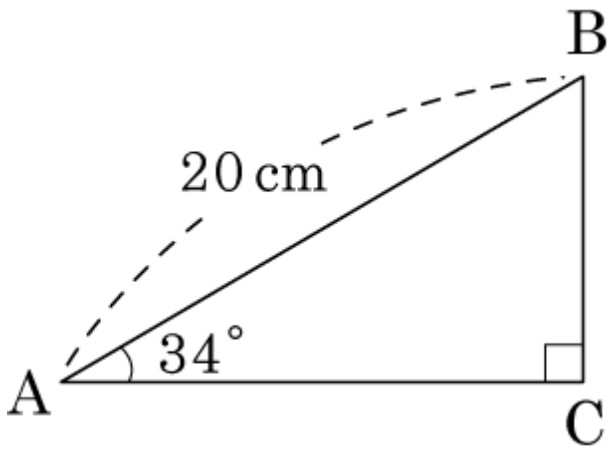
▶ 답 : _____ cm

▷ 정답 : 100 cm

해설

$$\overline{AC} = 200 \sin 30^\circ$$
$$= 200 \times \frac{1}{2} = 100\,\text{cm}$$

3. 다음 직각삼각형 ABC 에서 $\angle A = 34°$ 일 때, 높이 $\overline{BC}$ 를 구하여라. (단, $\sin 34° = 0.5592$, $\cos 34° = 0.8290$)



▶ 답 : _____ cm

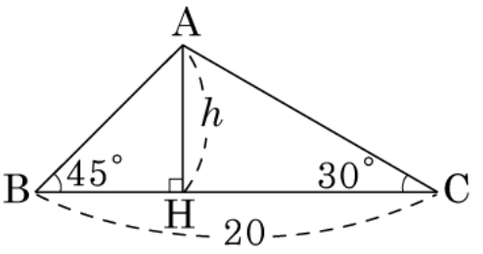
▷ 정답 : 11.184 cm

해설

$\sin 34° = \dfrac{\overline{BC}}{20}$

$\therefore\ \overline{BC} = 20 \times 0.5592 = 11.184\ (\text{cm})$

4. 다음 그림과 같은 $\triangle ABC$ 에서 높이 h 를 구하면?



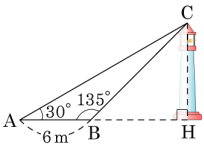
① $10\left(\sqrt{2}-1\right)$ ② $10\left(\sqrt{3}-1\right)$ ③ $10\left(\sqrt{3}-\sqrt{2}\right)$

④ $10\left(2\sqrt{2}-1\right)$ ⑤ $10\left(\sqrt{2}-2\right)$

해설

$$h = \frac{20}{\tan(90^\circ - 45^\circ) + \tan(90^\circ - 30^\circ)}$$
$$= \frac{20}{\tan 45^\circ + \tan 60^\circ}$$
$$= \frac{20}{1+\sqrt{3}}$$
$$= \frac{20\left(\sqrt{3}-1\right)}{3-1}$$
$$= 10\left(\sqrt{3}-1\right)$$

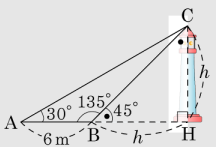
5. 다음 그림은 등대의 높이를 알아보기 위해 측정한 결과이다. 등대의 높이는?



① $(3-\sqrt{3})$m ② $(3\sqrt{3}-3)$m ③ $(4\sqrt{3}-1)$m

④ $(4\sqrt{3}+1)$m ⑤ $(3\sqrt{3}+3)$m

해설



등대의 높이를 h 라 하면

$\angle CBH = 45°$ 이므로 $\overline{BH} = h$

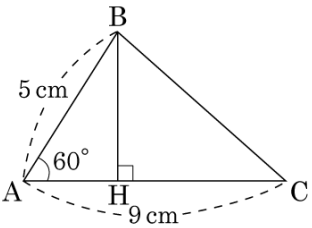
$\angle CAH = 30°$ 이므로

$6 + h : h = \sqrt{3} : 1$, $\sqrt{3}h = 6 + h$

$(\sqrt{3}-1)h = 6$

$\therefore h = \dfrac{6}{\sqrt{3}-1} = 3(\sqrt{3}+1) = 3\sqrt{3}+3(\text{m})$

6. 다음 그림과 같이 $\angle A = 60°$, $\overline{AB} = 5\text{cm}$, $\overline{AC} = 9\text{cm}$ 인 $\triangle ABC$ 에서 $\overline{BC}$ 의 길이를 구하여라.



▶ 답 : _____ cm

▷ 정답 : $\sqrt{61}$ cm

해설

$\overline{BH} = 5\sin 60° = 5 \times \frac{\sqrt{3}}{2} = \frac{5\sqrt{3}}{2}(\text{cm})$

$\overline{AH} = 5\cos 60° = 5 \times \frac{1}{2} = \frac{5}{2}(\text{cm})$

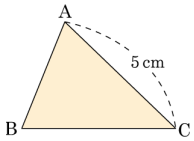
$\overline{CH} = 9 - \frac{5}{2} = \frac{13}{2}(\text{cm})$

$\overline{BC} = \sqrt{\left(\frac{5\sqrt{3}}{2}\right)^2 + \left(\frac{13}{2}\right)^2}$

$= \sqrt{\frac{75}{4} + \frac{169}{4}}$

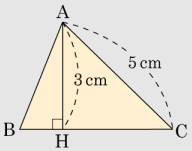
$= \sqrt{\frac{244}{4}} = \sqrt{61}(\text{cm})$

7. 다음 그림에서 $\overline{AC} = 5\text{cm}$ 이고 $\sin B = \frac{4}{5}$, $\sin C = \frac{3}{5}$ 일 때, $\overline{BC}$ 의 길이는?



① $\frac{21}{4}\text{cm}$ ② $\frac{23}{4}\text{cm}$ ③ $\frac{25}{4}\text{cm}$
④ $\frac{27}{4}\text{cm}$ ⑤ $\frac{31}{4}\text{cm}$

해설



$\sin C = \frac{3}{5}$ 에서 $\overline{AH} = 3(\text{cm})$

$\sin B = \frac{4}{5} = \frac{3}{\overline{AB}}$

$\therefore \overline{AB} = \frac{15}{4}$

$\overline{BH}^2 = \left(\frac{15}{4}\right)^2 - 3^2 = \frac{81}{16}$

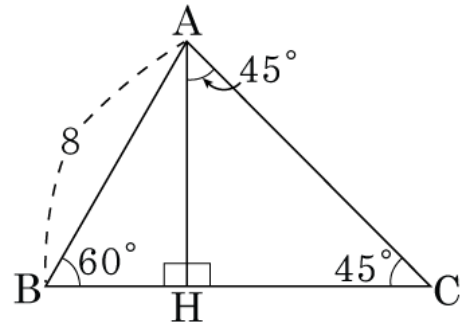
$\therefore \overline{BH} = \frac{9}{4}(\text{cm})$

$\overline{HC}^2 = 5^2 - 3^2 = 4^2$

$\therefore \overline{HC} = 4(\text{cm})$

$\overline{BC} = \overline{BH} + \overline{HC} = \frac{9}{4} + 4 = \frac{25}{4}(\text{cm})$

8. 다음과 같은 $\triangle ABC$ 에서 $\overline{AC}$ 의 길이를 구하여라.



▶ 답 :

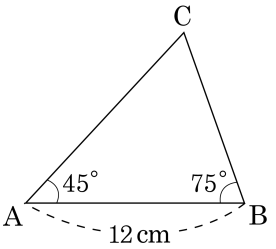
▷ 정답 : $4\sqrt{6}$

해설

$\overline{AH} = 8 \times \sin 60° = 8 \times \frac{\sqrt{3}}{2} = 4\sqrt{3}$ 이므로

$\overline{AC} = \frac{\overline{AH}}{\cos 45°} = \frac{4\sqrt{3}}{\frac{\sqrt{2}}{2}} = \frac{8\sqrt{3}}{\sqrt{2}} = 4\sqrt{6}$ 이다.

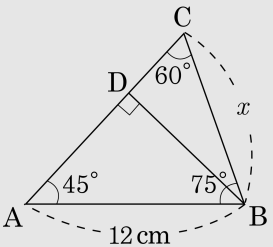
9. 다음 $\triangle ABC$ 에서 $\angle A = 45°$, $\angle B = 75°$, $\overline{AB} = 12\text{cm}$ 일 때, $\overline{BC}$ 의 길이를 구하여라.



▶ 답 : cm

▷ 정답 : $4\sqrt{6}$ cm

해설



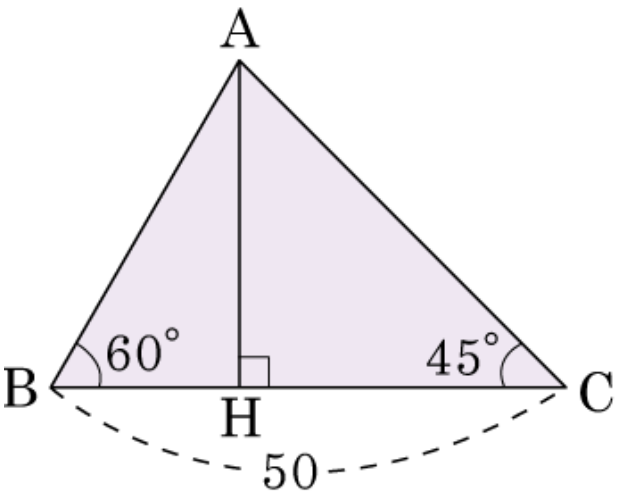
$12\sin 45° = x\sin 60°$

$12 \times \frac{\sqrt{2}}{2} = x \times \frac{\sqrt{3}}{2}, 12\sqrt{2} = \sqrt{3}x$

$\therefore x = \frac{12\sqrt{2}}{3} = \frac{12\sqrt{6}}{3}$

$= 4\sqrt{6}(\text{cm})$

10. 다음 그림의 $\triangle ABC$ 에서 $\overline{AH}$ 의 길이는?



① $25(\sqrt{3}-1)$ ② $25(3-\sqrt{3})$ ③ $25\sqrt{3}-1$

④ $50\sqrt{3}-1$ ⑤ $50\sqrt{3}+1$

해설

$\overline{BH}=a$ 라 하면 $a:\overline{AH}=1:\sqrt{3}$ 이므로

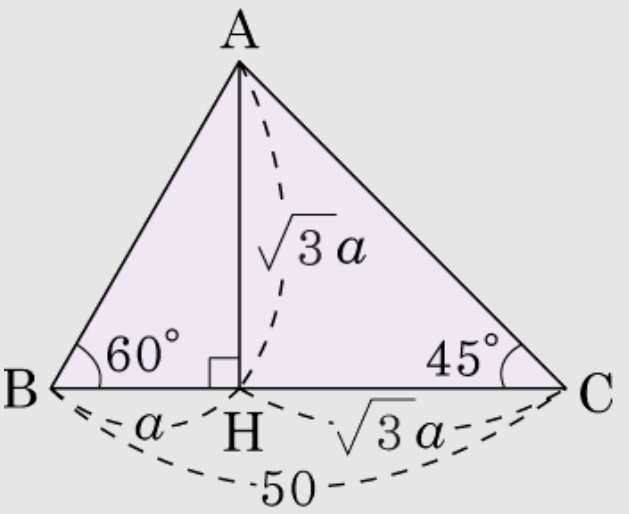
$\overline{AH}=\sqrt{3}a$

$\overline{CH}=\overline{AH}=\sqrt{3}a$, $\overline{BC}=a+\sqrt{3}a=50$

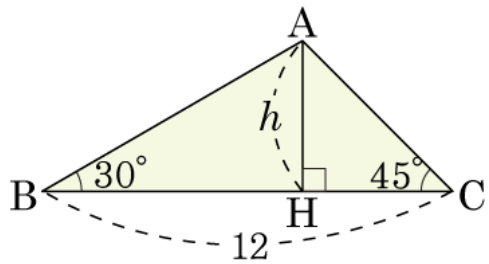
$(1+\sqrt{3})a=50,\ a=\dfrac{50}{\sqrt{3}+1}=$

$25(\sqrt{3}-1)$

$\therefore \overline{AH}=\sqrt{3}\times 25(\sqrt{3}-1)=25(3-\sqrt{3})$



11. 다음 $\triangle ABC$ 에서 높이 h 를 구하여라.



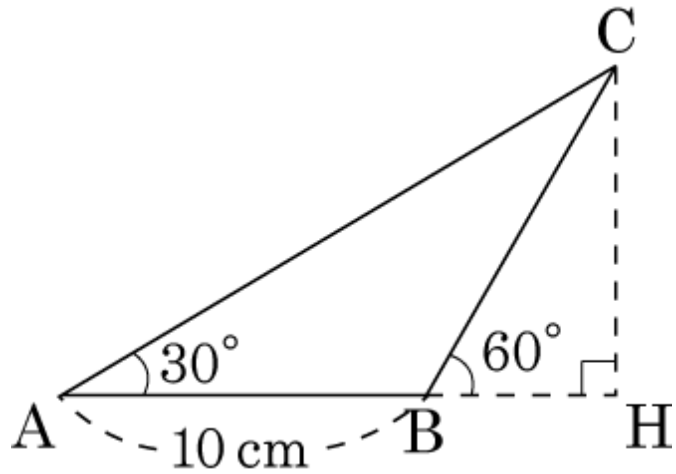
▶ 답 :

▷ 정답 : $6\sqrt{3}-6$

해설

$$\begin{aligned} h &= \frac{12}{\tan 60^\circ + \tan 45^\circ} \\ &= \frac{12}{\sqrt{3}+1} \\ &= 6(\sqrt{3}-1) \end{aligned}$$

12. 다음 그림의 삼각형 ABC 에서 $\overline{AB} = 10\text{cm}, \angle A = 30°, \angle CBH = 60°$ 이다. $\overline{CH}$ 의 길이를 구하여라.



▶ 답 : _____ cm

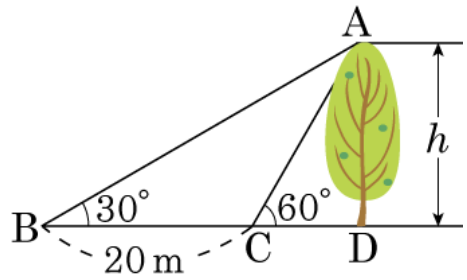
▷ 정답 : $5\sqrt{3}$ cm

해설

$\overline{AB} = \overline{BC} = 10(\text{cm})$

$\overline{CH} = 10\sin 60° = 10 \times \frac{\sqrt{3}}{2} = 5\sqrt{3}(\text{cm})$

13. 다음 그림에서 나무의 높이 h 를 구하여라. (단, $\sqrt{3} = 1.7$ 로 계산한다.)



▶ 답 : $\underline{\quad\quad}$ m

▷ 정답 : $\underline{17}$ m

해설

$\angle BAC = 30°$ 이므로

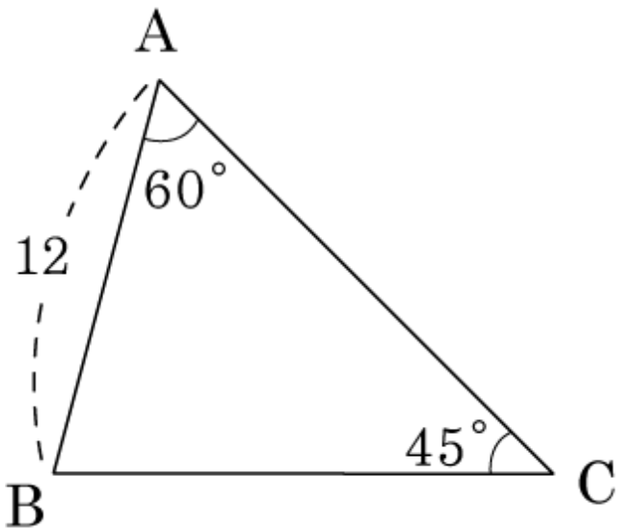
$\overline{BC} = \overline{AC} = 20(\text{m})$

$\triangle ACD$ 에서

$$h = 20\sin 60° = 20 \times \frac{\sqrt{3}}{2} = 10\sqrt{3} = 10 \times 1.7 = 17(\text{m})$$

$\therefore\ h = 17\text{m}$

14. 다음 그림에서 $\triangle ABC$ 의 넓이를 구하여라.



▶ 답 :

▷ 정답 : $54 + 18\sqrt{3}$

해설

$\overline{AH} = 12\cos 60° = 6$

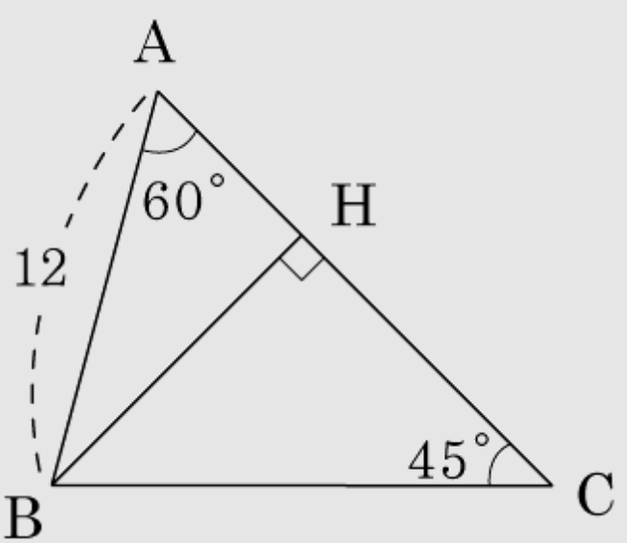
$\overline{BH} = \overline{CH} = 12\sin 60° = 6\sqrt{3}$

$\overline{AC} = \overline{AH} + \overline{CH} = 6 + 6\sqrt{3}$

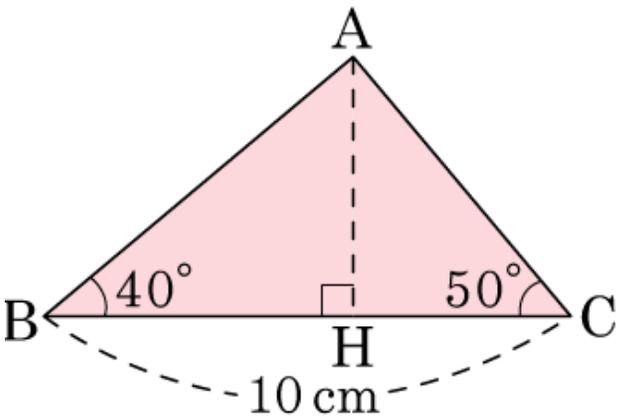
따라서 $\triangle ABC$ 의 넓이는

$\frac{1}{2} \times 12 \times \left(6 + 6\sqrt{3}\right) \times \sin 60° =$

$54 + 18\sqrt{3}$ 이다.

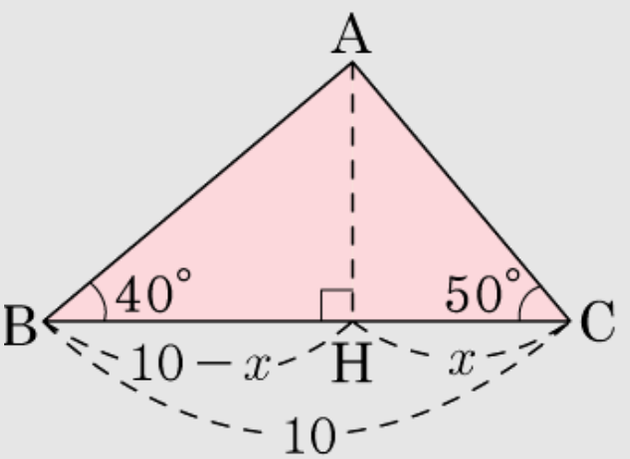


15. 다음 그림과 같이 삼각형 ABC 에서 $\overline{BC} = 10\,\text{cm}$, $\overline{AH} \perp \overline{BC}$, $\angle ABC = 40°$, $\angle ACB = 50°$ 일 때, $\overline{CH}$ 의 길이는? (단, $\tan 50° = 1.2$, $\tan 40° = 0.8$)



① 2 cm ② 4 cm ③ 5 cm ④ 6 cm ⑤ 7 cm

해설



$\overline{CH} = x\,\text{cm}$ 라 하면 $\triangle ACH$ 에서 $\overline{AH} = x\tan 50°$

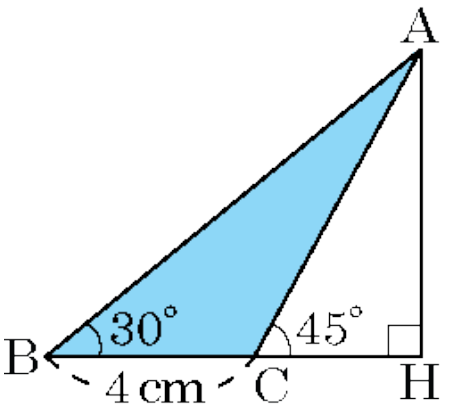
$\triangle ABH$ 에서 $\overline{AH} = (10 - x)\tan 40°$

$x\tan 50° = 10\tan 40° - x\tan 40°$

$x(\tan 50° + \tan 40°) = 10\tan 40°$

$$\therefore x = \frac{10\tan 40°}{\tan 50° + \tan 40°} = \frac{10 \times 0.8}{1.2 + 0.8} = 4(\,\text{cm})$$

16. 다음 그림에서 $\overline{BC} = 4\text{cm}$, $\angle B = 30°$, $\angle ACH = 45°$ 일 때, $\triangle ABC$ 의 넓이는?



① 5cm^2 ② 7cm^2 ③ $3(\sqrt{2}+1)\text{cm}^2$

④ $3(3-\sqrt{2})\text{cm}^2$ ⑤ $4(\sqrt{3}+1)\text{cm}^2$

해설

$\overline{AH} = x\text{cm}$ 라 하면 $\overline{CH} = x\text{cm}$

$\triangle ABH$ 에서 $\tan 30° = \dfrac{x}{4+x} = \dfrac{1}{\sqrt{3}}$

$\sqrt{3}x = 4 + x$, $(\sqrt{3}-1)x = 4$

$\therefore\ x = \dfrac{4}{\sqrt{3}-1} = 2(\sqrt{3}+1)$

$\triangle ABC = \dfrac{1}{2} \times 4 \times 2(\sqrt{3}+1) = 4(\sqrt{3}+1)(\text{cm}^2)$