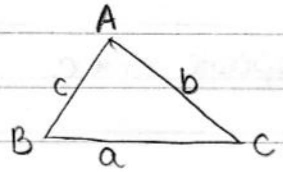
6.4 2, 11, 16, 17, 23, 24, 27

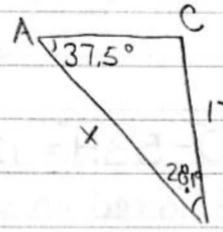
Law of Sines

For the triangle



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

2.



To find side x we'll need angle C and the law of sines. Since we know the other two angles and that there are 180° in a triangle,

$C = 180° - (37.5° + 28.1°)$

$= 114.4°$

Thus by the law of sines:

$$\frac{\sin C}{x} = \frac{\sin A}{17}$$

$$\frac{\sin 114.4°}{x} = \frac{\sin 37.5°}{17}$$

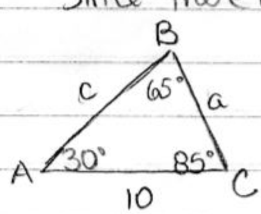
Solve for x.

$$x = \frac{17 \sin 114.4°}{\sin 37.5°} \approx 25.4$$

Remember to be in degree mode

11. $\angle A = 30°$ $\angle C = 65°$ $b = 10$

Since there are 180° in a triangle: $\angle B = 180° - (30° + 65°) = 85°$



By Law of Sines:

$$\frac{\sin 30°}{a} = \frac{\sin 65°}{10} \quad \text{and} \quad \frac{\sin 85°}{c} = \frac{\sin 65°}{10}$$

Solve for a and c in each equation

$10 \sin 30° = a \sin 65°$

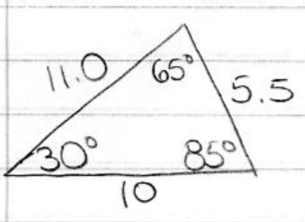
$a = \frac{10 \sin 30°}{\sin 65°}$

≈ 5.5

$10 \sin 85° = c \sin 65°$

$c = \frac{10 \sin 85°}{\sin 65°}$

≈ 11.0 (rounded up from 10.99)



End result

16 $a=30$, $c=40$, $\angle A=37°$

We will first find $\angle C$, which is opposite side c.

$$\frac{\sin C}{40}=\frac{\sin 37°}{30}$$

$$\sin C=\frac{40\sin 37°}{30}=0.8024$$

There are two possibilities for C, $53.4°$ and $180°-53.4°=126.6°$. I got $53.4°$ by $\sin^{-1}(0.8024)$. See the text in red on p 508.

If $\angle C=53.4°$, then $\angle B=180°-(37°+53.4°)=89.6°$

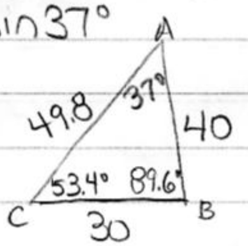
Thus by Law of Sines

$$\frac{\sin 89.6°}{b}=\frac{\sin 37°}{30}$$

so $b=\dfrac{30\sin 89.6°}{\sin 37°}=49.8$

We could have used $\dfrac{\sin 89.6°}{b}=\dfrac{\sin 53.4°}{40}$.
I used a and A since these were given at the start of the problem.

Thus we get



(This is almost a right triangle with sides in proportion 3-4-5. This may be what the author intended.)

If $\angle C=126.6°$, then $\angle B=180°-(37°+126.6°)=16.4°$

By Law of Sines:

$$\frac{\sin 16.4°}{b}=\frac{\sin 37°}{30}$$

so $b=\dfrac{30\sin 16.4°}{\sin 37°}=14.1$

Hence we get: