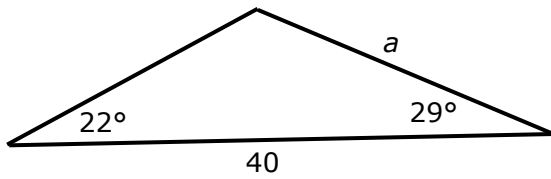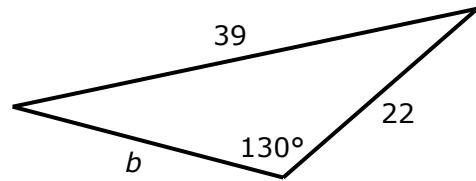# Level 2 Trigonometry Achieved + Merit #1

1. Calculate length *a*

2. Calculate length *b.*

3. Calculate angle *C*

4. What is the area of this triangle?

5. What is the area of this triangle?

6. What is the area of this triangle?

7. What is the area of this quadrilateral?

8. Calculate the perimeter of this quadrilateral.

9. What is the area of this quadrilateral?
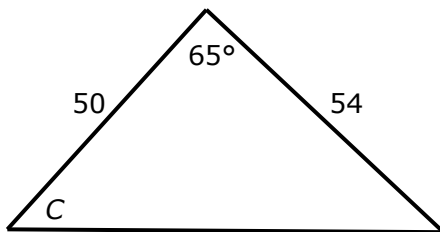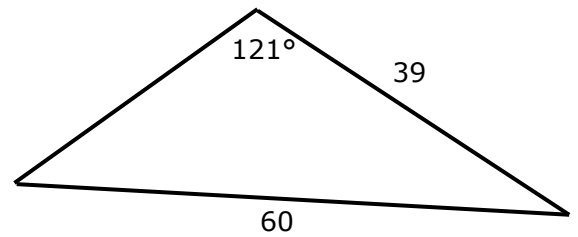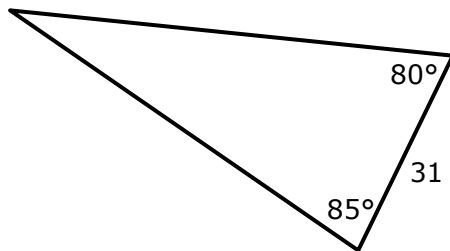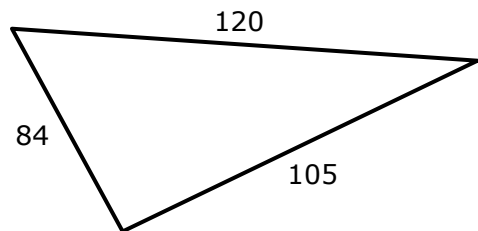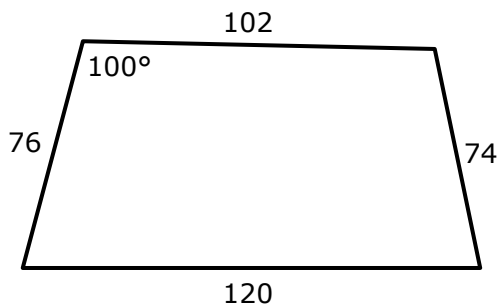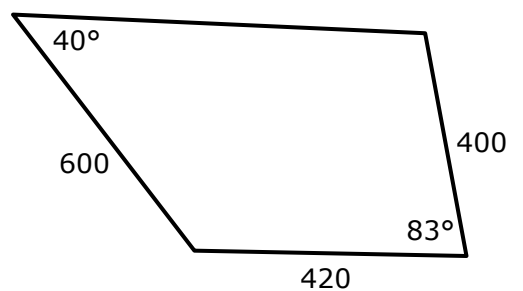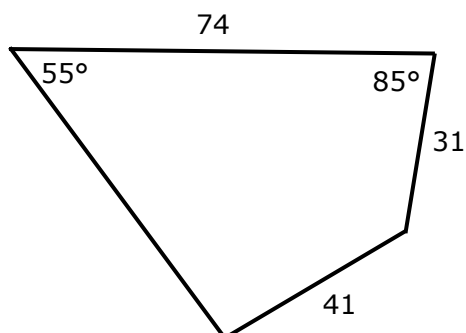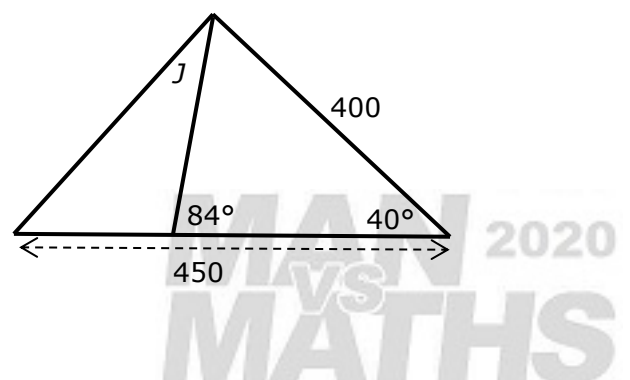
10. Calculate angle *J*

Answers: Level 2 Trigonometry Achieved + Merit #1

Note three skills gets you Achieved. you do not have to get to the end of problem.

If you get the correct answer, then you have done it right, even if you do it another way.

1.   Top angle is $180 - 22 - 29 = 129°$

$$a = \frac{40}{\sin 129} \times \sin(22) = 19.281$$

2.   Call left angle in the triangle x and the right angle y.

$\sin x = \dfrac{\sin 130}{39} \times 22 = 0.43213$ $x = \sin^{-1}(0.43213) = 25.603°$

$y = 180 - 130 - 25.603 = 24.397°$

$b = \dfrac{39}{\sin 130} \times \sin(24.397) = 21.029$ or $b = \dfrac{22}{\sin 25.603} \times \sin(24.397) = 21.029$

3.   Let the bottom side length be x

$x^2 = 50^2 + 54^2 - 2 \times 50 \times 54 \times \cos 65 = 3133.86$ $x = \sqrt{3133.86} = 55.981$

$\sin C = \dfrac{\sin 65}{55.981} \times 54 = 0.87424$ $C = \sin^{-1}(0.87424) = 60.955°$

   or

$\cos C = \dfrac{50^2 + 55.981^2 - 54^2}{2 \times 50 \times 55.981} = \dfrac{2717.87}{5598.1}$ $x° = \cos^{-1}(\dfrac{2717.87}{5598.1}) = 60.955°$

4.   Let left hand angle $= x$ and right hand angle $= y$.

$\sin x = \dfrac{\sin 121}{60} \times 39 = 0.55716$ $x = \sin^{-1}(0.55716) = 33.860°$

$y = 180 - 121 - 33.856 = 25.140°$

Area $= \frac{1}{2} \times 39 \times 60 \times \sin 25.140 = 497.06$

5.   Let left hand angle $= x$, top length $= y$, bottom length $= z$ $x = 180 - 80 - 85 = 15$

$y = \dfrac{31}{\sin 15} \times \sin(85) = 119.32$ Area $= \frac{1}{2} \times 31 \times 119.32 \times \sin 80 = 1821.35$

or $z = \dfrac{31}{\sin 15} \times \sin(80) = 117.96$ Area $= \frac{1}{2} \times 31 \times 117.96 \times \sin 85 = 1821.35$
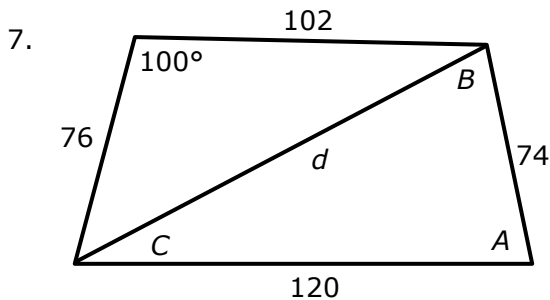
or $y = 119.32$ and $z = 117.96$ Area $= \frac{1}{2} \times 119.32 \times 117.96 \times \sin 15 = 1821.35$

6.   Top right angle $= x$, top left $= y$, bottom $= z$

$\cos x = \dfrac{120^2 + 84^2 - 105^2}{2 \times 120 \times 84} = \dfrac{10431}{20160}$ $x° = \cos^{-1}(\dfrac{10431}{20160}) = 58.84°$

Area $= \frac{1}{2} \times 84 \times 120 \times \sin 58.84 = 4312.9$

(or via $y = 43.20°$ or via $z = 77.96°$)

7.

$d^2 = 102^2 + 76^2 - 2 \times 102 \times 76 \times \cos 100 = 18872$

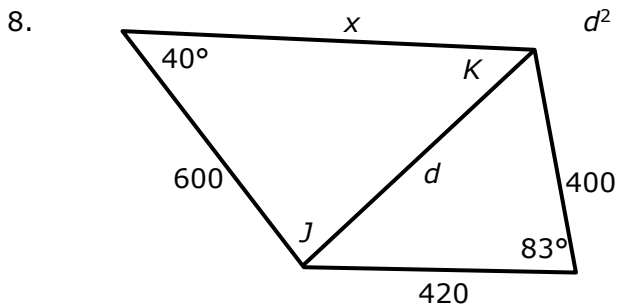$d = \sqrt{18872} = 137.38$

Area LH triangle $= \frac{1}{2} \times 102 \times 76 \times \sin 100 = 3817.1$

$\cos A = \dfrac{74^2 + 120^2 - 137.38^2}{2 \times 74 \times 120} = \dfrac{1002.7}{17760}$

$A = \cos^{-1}\left(\dfrac{1002.7}{17760}\right) = 86.76°$

(if you go via B or C, then $B = \cos^{-1}(0.8430) = 32.53°$ and $C = \cos^{-1}(0.4893) = 60.70°$)

Area RH triangle $= \frac{1}{2} \times 120 \times 74 \times \sin(86.76) = 4432.9$ Total $= 3817 + 4433 = 8250$

8.

$d^2 = 400^2 + 420^2 - 2 \times 400 \times 420 \times \cos 83 = 295451$
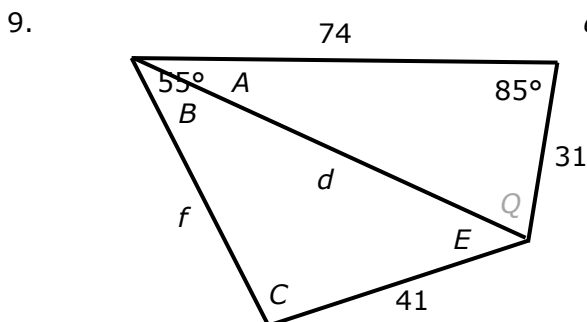
$d = \sqrt{295451} = 543.55$

$\sin K = \dfrac{\sin 40}{543.55} \times 600 = 0.70954$

$K = \sin^{-1}(0.70954) = 45.20°$

$J = 180 - 40 - 45.2 = 94.8°$

$x = \dfrac{543.55}{\sin 40} \times \sin(94.8) = 842.6$ Perimeter $= 842.6 + 600 + 400 + 420 = 2262.6$

9.

$d^2 = 31^2 + 74^2 - 2 \times 31 \times 74 \times \cos 85 = 6037.13$

$d = \sqrt{6037.13} = 77.699$

Still just 2 pieces of information for bottom Δ

$\sin A = \dfrac{\sin 85}{77.699} \times 31 = 0.39746$

$A = \sin^{-1}(0.39746) = 23.42°$

$B = 55 - 23.42 = 31.58°$ now 3 pieces

$\sin C = \dfrac{\sin 31.58}{41} \times 77.699 = 0.99244$ $C = \sin^{-1}(0.68966) = 82.95°$

$E = 180 - 31.58 - 82.95 = 65.47°$ $f = \dfrac{41}{\sin 31.58} \times \sin 65.47 = 71.22$

Area top $= \frac{1}{2} \times 74 \times 31 \times \sin 85 = 1142$

Area bottom $= \frac{1}{2} \times 71.22 \times 77.699 \times \sin 31.58 = 1449$ Total $= 1142 + 2281 = 2590$

10.
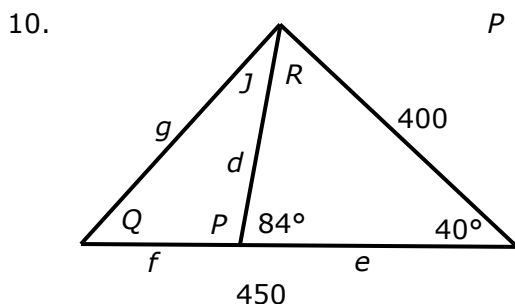
$P = 180 - 84 = 96°$ $R = 180 - 84 - 40 = 56°$

$d = \dfrac{400}{\sin 84} \times \sin 40 = 258.53$

$e = \dfrac{400}{\sin 84} \times \sin 56 = 333.44$

$f = 450 - 33.44 = 116.56$

$g = 294.49$ by Cos Rule

$J = 23.18°$ by Cos Rule