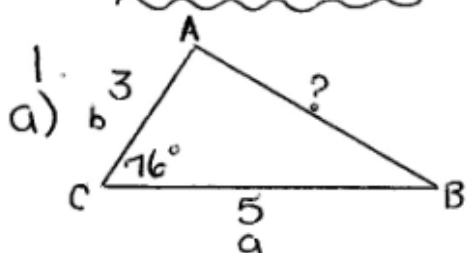


SOLUTIONS => LAW OF COSINES WORKSHEET

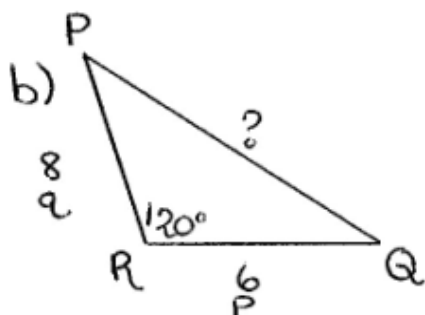
$$c^2 = a^2 + b^2 - 2ab \cos C$$

$$c^2 = (5)^2 + (3)^2 - 2(5)(3)\cos 76^\circ$$

$$c^2 = 25 + 9 - 7.2577$$

$$c^2 = 26.7423$$

$$c = 5.2$$



$$r^2 = p^2 + q^2 - 2pq \cos R$$

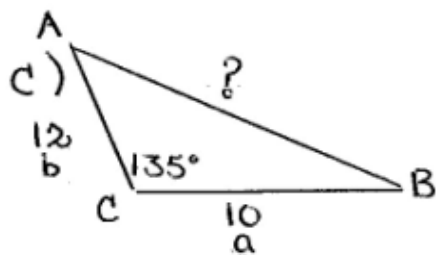
$$r^2 = (6)^2 + (8)^2 - 2(6)(8)\cos 120^\circ$$

$$r^2 = 36 + 64 - (-48)$$

$$r^2 = 100 + 48$$

$$r^2 = 148$$

$$r = 12.2$$



$$c^2 = a^2 + b^2 - 2ab \cos C$$

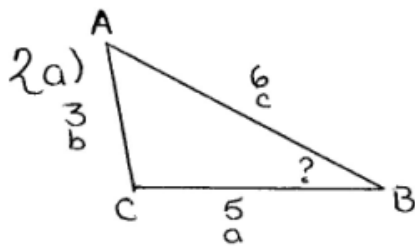
$$c^2 = (10)^2 + (12)^2 - 2(10)(12) \cos 135^\circ$$

$$c^2 = 100 + 144 - (-169.7056)$$

$$c^2 = 244 + 169.7056$$

$$c^2 = 413.7056$$

$$c = 20.3$$



$$\cos B = \frac{a^2 + c^2 - b^2}{2ac}$$

$$\cos B = \frac{(5)^2 + (6)^2 - (3)^2}{2(5)(6)}$$

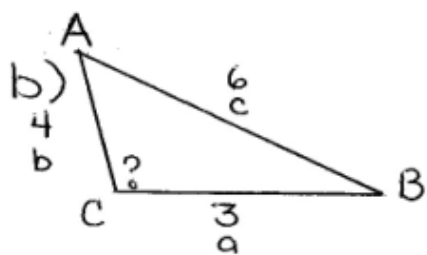
$$\cos B = \frac{25 + 36 - 9}{60}$$

$$\cos B = \frac{52}{60}$$

$$\cos B = 0.8667$$

$$B = \cos^{-1}(0.8667)$$

$$B = 30^\circ$$



$$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$$

$$\cos C = \frac{(3)^2 + (4)^2 - (6)^2}{2(3)(4)}$$

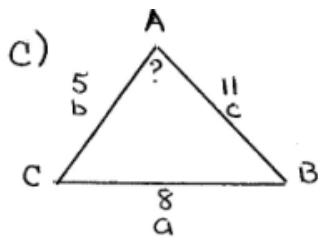
$$\cos C = \frac{9 + 16 - 36}{24}$$

$$\cos C = \frac{-11}{24}$$

$$\cos C = -0.4583$$

$$C = \cos^{-1}(-0.4583)$$

$$C = 117^\circ$$



$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

$$\cos A = \frac{(5)^2 + (11)^2 - (8)^2}{2(5)(11)}$$

$$\cos A = \frac{25 + 121 - 64}{110}$$

$$\cos A = \frac{82}{110}$$

$$\cos A = 0.7455$$

$$A = \cos^{-1}(0.7455)$$

$$A = 42^\circ$$

3. $r^2 = p^2 + q^2 - 2pq \cos R$

$$r^2 = (10)^2 + (12)^2 - 2(10)(12)\left(\frac{1}{5}\right)$$

$$r^2 = 100 + 144 - 240(0.2000)$$

$$r^2 = 244 - 48$$

$$r^2 = 196$$

$$r = \sqrt{196}$$

$$r = 14$$

$$p = 10$$

$$q = 12$$

$$\cos R = \frac{1}{5}$$

$$r = ?$$

$$\begin{aligned}
 4. \quad \cos U &= \frac{t^2 + v^2 - u^2}{2tv} & t &= 10 \\
 \cos U &= \frac{(10)^2 + (12)^2 - (14)^2}{2(10)(12)} & u &= 14 \\
 \cos U &= \frac{100 + 144 - 196}{240} & v &= 12 \\
 \cos U &= \frac{48}{240} & \cos U &= ? \\
 \cos U &= 0.2000
 \end{aligned}$$

$$\begin{aligned}
 5a) \quad p^2 &= m^2 + n^2 - 2mn \cos P & m &= 8 \\
 p^2 &= (8)^2 + (8)^2 - 2(8)(8) \cos 48^\circ & n &= 8 \\
 p^2 &= 64 + 64 - 85.6487 & \angle P &= 48^\circ \\
 p^2 &= 42.4513 & p &= ? \\
 p &= \sqrt{42.4513} \\
 p &= 6.5
 \end{aligned}$$

$$\begin{aligned}
 5b) \cos P &= \frac{q^2 + r^2 - p^2}{2qr} \\
 \cos P &= \frac{(3)^2 + (4)^2 - (4)^2}{2(3)(4)} \\
 \cos P &= \frac{9 + 16 - 16}{24} \\
 \cos P &= \frac{9}{24} \\
 \cos P &= 0.3750 \\
 P &= \cos^{-1}(0.3750) \\
 P &= 68^\circ
 \end{aligned}$$

$$\begin{aligned}
 p &= 4 \\
 q &= 3 \\
 r &= 4 \\
 \angle P &= ?
 \end{aligned}$$

$$\begin{aligned}
 d) \cos C &= \frac{a^2 + b^2 - c^2}{2ab} \\
 \cos C &= \frac{(5)^2 + (7)^2 - (8)^2}{2(5)(7)} \\
 \cos C &= \frac{25 + 49 - 64}{70} \\
 \cos C &= \frac{10}{70} \\
 \cos C &= 0.1429 \\
 C &= \cos^{-1}(0.1429) \\
 C &= 82^\circ
 \end{aligned}$$

$$\begin{aligned}
 6a) \quad q^2 &= p^2 + r^2 - 2pr \cos Q & p &= 4.1 \\
 q^2 &= (4.1)^2 + (6.3)^2 - 2(4.1)(6.3) \cos 53^\circ & r &= 6.3 \\
 q^2 &= 16.81 + 39.69 - 31.0898 & \angle Q &= 53^\circ \\
 & & q &= ? \\
 q^2 &= 25.4102 \\
 q &= \sqrt{25.4102} \\
 q &= 5.0
 \end{aligned}$$

$$\begin{aligned}
 b) \quad e^2 &= d^2 + f^2 - 2df \cos E & d &= 9.6 \\
 e^2 &= (9.6)^2 + (8.3)^2 - 2(9.6)(8.3) \cos 126^\circ & f &= 8.3 \\
 e^2 &= 92.16 + 68.89 - (-93.6695) & E &= 126^\circ \\
 & & e &= ? \\
 e^2 &= 161.05 + 93.6695 \\
 e^2 &= 254.7195 \\
 e &= \sqrt{254.7195} \\
 e &= 16.0
 \end{aligned}$$

7a) To find u :

$$\begin{aligned}
 u^2 &= t^2 + v^2 - 2tv \cos U \\
 u^2 &= (7)^2 + (6)^2 - 2(7)(6) \cos 43^\circ \\
 u^2 &= 49 + 36 - 84(0.7314) \\
 u^2 &= 85 - 61.4337 \\
 u^2 &= 23.5663 \\
 u &= \sqrt{23.5663} \\
 u &= 4.9
 \end{aligned}$$

To find $\angle V$:

$$\begin{aligned}
 t &= 7 \\
 v &= 6 \\
 \angle U &= 43^\circ \\
 \cos V &= \frac{t^2 + u^2 - v^2}{2tu} \\
 \cos V &= \frac{(7)^2 + (4.9)^2 - (6)^2}{2(7)(4.9)} \\
 \cos V &= \frac{49 + 23.5663 - 36}{68.6} \\
 \cos V &= \frac{36.5663}{68.6} \\
 \cos V &= 0.5330 \\
 V &= \cos^{-1}(0.5330) \\
 V &= 58^\circ
 \end{aligned}$$

$$\begin{aligned}
 \angle T &= 180^\circ - 43^\circ - 58^\circ \\
 \angle T &= 79^\circ
 \end{aligned}$$

b) To find $\angle J$:

$$\cos J = \frac{f^2 + k^2 - j^2}{2fk}$$

$$\cos J = \frac{(5.8)^2 + (6.3)^2 - (4.5)^2}{2(5.8)(6.3)}$$

$$\cos J = \frac{33.64 + 39.69 - 20.25}{73.08}$$

$$\cos J = \frac{53.08}{73.08}$$

$$\cos J = 0.7263$$

$$J = \cos^{-1}(0.7263)$$

$$J = 43^\circ$$

$$\begin{aligned} j &= 4.5 \\ k &= 6.3 \\ f &= 5.8 \end{aligned}$$

To find $\angle K$:

$$\cos K = \frac{j^2 + f^2 - k^2}{2jf}$$

$$\cos K = \frac{(4.5)^2 + (5.8)^2 - (6.3)^2}{2(4.5)(5.8)}$$

$$\cos K = \frac{20.25 + 33.64 - 39.69}{52.2}$$

$$\cos K = \frac{14.2}{52.2}$$

$$\cos K = 0.2720$$

$$K = \cos^{-1}(0.2720)$$

$$K = 74^\circ$$

$$\begin{aligned} \angle F &= 180^\circ - 43^\circ - 74^\circ \\ \angle F &= 63^\circ \end{aligned}$$

c) To find h :

$$h^2 = p^2 + w^2 - 2pw \cos H$$

$$h^2 = (49)^2 + (6.3)^2 - 2(49)(6.3) \cos 136^\circ$$

$$h^2 = 24.01 + 39.69 - (-44.4096)$$

$$p = 49$$

$$w = 6.3$$

$$H = 136^\circ$$

$$h^2 = 108.1096$$

$$h = \sqrt{108.1096}$$

$$h = 10.4$$

To find $\angle P$:

$$\cos P = \frac{h^2 + w^2 - p^2}{2hw}$$

$$\cos P = \frac{(10.4)^2 + (6.3)^2 - (49)^2}{2(10.4)(6.3)}$$

$$\cos P = \frac{108.16 + 39.69 - 2401}{131.04}$$

$$\cos P = \frac{123.84}{131.04}$$

$$\cos P = 0.9451$$

$$P = \cos^{-1}(0.9451)$$

$$P = 19^\circ$$

$$\angle W = 180^\circ - 136^\circ - 19^\circ$$

$$\angle W = 25^\circ$$