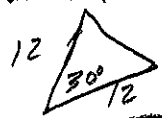
(1) Regular Dodecagon area in a circle with radius 12 (Work with 1 $\triangle$)

$\boxed{B}$ Central angle $= \frac{360^\circ}{12} = 30^\circ$



Area $= \frac{1}{2}(12)(12)\sin 30^\circ = \frac{144}{4} = \frac{72}{2}$

Total Area $= 12\left(\frac{72}{2}\right) = 6(72) = \boxed{432}$

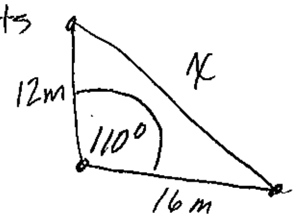
(2) Area of $\triangle$. Sides $= 7, 8, 9$ semiperimeter $= s = \frac{7+8+9}{2} = 12$

$\boxed{B}$ Area $= \sqrt{12(12-7)(12-8)(12-9)} = \sqrt{12(5)(4)(3)} = \sqrt{720} = \sqrt{(144)(5)}$

$= \boxed{12\sqrt{5}}$

(3) 2 Boats

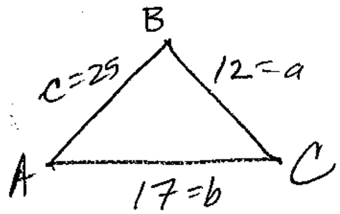
$\boxed{C}$



$x = \sqrt{12^2 + 16^2 - 2(12)(16)\cos 110^\circ}$

$x = 23.0507$ miles $\approx \boxed{23 \text{ miles}}$

(4) $\triangle$ with sides 12, 17, 25; smallest angle

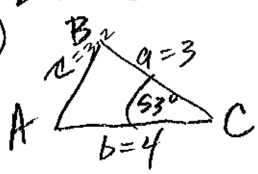


$\boxed{E}$ $12^2 = 25^2 + 17^2 - 2(25)(17)\cos A$

$A = \cos^{-1}\left[\frac{12^2 - 25^2 - 17^2}{-2 * 25 * 17}\right]$, $A = 25.057^\circ \approx \boxed{25^\circ}$

(5) $\triangle ABC$

(a)



$c^2 = 3^2 + 4^2 - 2(3)(4)\cos 53^\circ$

$\boxed{c = 3.249\ldots} \rightarrow c$

$\frac{\sin A}{3} = \frac{\sin 53^\circ}{3.249\ldots}$ *A is the smaller of angles A & B

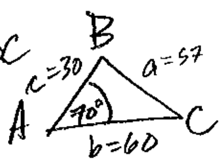
$A = \sin^{-1}\left(\frac{3\sin 53^\circ}{3.249}\right)$

$\boxed{A = 47.511^\circ}$

$B = 180^\circ - 53^\circ - 47.511^\circ\ldots$

$\boxed{B = 79.488^\circ}$

(6) $\triangle ABC$



$a^2 = 30^2 + 60^2 - 2(30)(60)\cos 70^\circ$

$\boxed{a = 57.172\ldots} \rightarrow A$

$\frac{\sin C}{30} = \frac{\sin 70}{57.172}$ *C is smaller of angles C & B

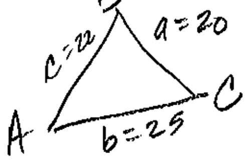
$C = \sin^{-1}\left(\frac{30\sin 70^\circ}{57.172\ldots}\right)$

$\boxed{C = 29.543^\circ}$

$B = 180^\circ - 70^\circ - 29.543^\circ\ldots$

$\boxed{B = 80.456^\circ}$

(c) $\triangle ABC$



$25^2 = 22^2 + 20^2 - 2(22)(20)\cos B$

$B = \cos^{-1}\left(\frac{25^2 - 22^2 - 20^2}{-2 * 22 * 20}\right)$

$\boxed{B = 72.883^\circ} \rightarrow B$

$\frac{\sin A}{20} = \frac{\sin B}{25}$

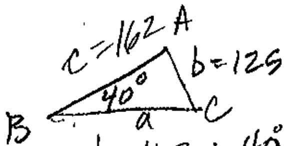
$A = \sin^{-1}\left(\frac{20\sin B}{25}\right)$

$\boxed{A = 49.868^\circ}$

$C = 180^\circ - B - A$

$\boxed{C = 57.248^\circ}$

(6) (a) $b=125,\ c=162,\ B=40°$
(ambg. case)



$h=162\sin 40°=104.131$
→ 2 solns

Acute case

$\frac{\sin C}{162}=\frac{\sin 40°}{125}$

$C=\sin^{-1}\left(\frac{162\sin 40°}{125}\right)$

$\boxed{C=56.413°}$ → C

$A=180°-40°-C$

$\boxed{A=83.586°}$ → A

$\frac{a}{\sin A}=\frac{125}{\sin 40}$

$a=\frac{125\sin A}{\sin 40}$ $\boxed{a=193.248}$

Obtuse Case

$C=180°-56.413...$

$\boxed{C=123.586°}$ → C

$A=180°-40°-C$

$\boxed{A=16.413°}$ → A

$a=\frac{125\sin A}{\sin 40°}$

$\boxed{a=54.950}$

(c) $a=e,\ b=\pi,\ C=e\pi°$
(SAS)

$c^2=e^2+\pi^2-2e\pi\cos(e\pi)$

$\boxed{c=0.607}$ → c

$\frac{\sin A}{e}=\frac{\sin(e\pi)}{0.607}$

$A=\sin^{-1}\left(\frac{e\sin(e\pi)}{0.607...}\right)$

$\boxed{A=41.674°}$ → A

$B=180°-e\pi°-A$

$\boxed{B=129.785°}$

(b) $a=73.5,\ B=61°,\ C=83°$ (ASA)

$A=180°-61°-83°$

$\boxed{A=36°}$

$\frac{b}{\sin 61°}=\frac{73.5}{\sin 36°}$

$b=\frac{73.5\sin 61°}{\sin 36°}$

$\boxed{b=109.367}$

$\frac{c}{\sin 83°}=\frac{73.5}{\sin 36°}$

$c=\frac{73.5\sin 83°}{\sin 36°}$

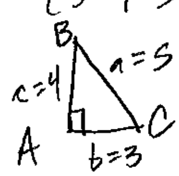
$\boxed{c=124.113}$

(d) $b=3,\ c=4,\ A=90°$, SAS

$a^2=3^2+4^2-2(3)(4)\cos 90°$

$\boxed{a=5}$

(Right △)
(3-4-5 Rt△)



$\sin C=\frac{4}{5}$

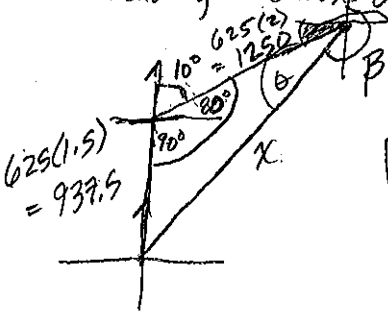
$C=\sin^{-1}\left(\frac{4}{5}\right)$

$\boxed{C=53.130°}$ → c

$B=180°-90°-C$

$\boxed{B=36.869°}$

(7) * we can choose any original heading. I choose due Nort



$x = \sqrt{937.5^2 + 1250^2 - 2(937.5)(1250)\cos(170^\circ)}$

$\boxed{x = 2179.346 \text{ miles}} \to X$

$\dfrac{\sin\theta}{937.5} = \dfrac{\sin 170^\circ}{x}$, $\theta = \sin^{-1}\left(\dfrac{937.5\sin 170}{x}\right)$

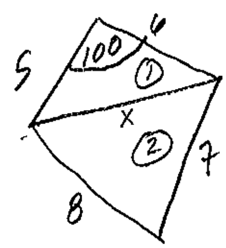
$\boxed{\theta = 4.2839^\circ} \to A$

$\beta = 180^\circ + (90^\circ - 80^\circ - \theta)$

$\boxed{\beta = 185.716^\circ}$

(Relative to her original heading)

(8) (a)



$x = \sqrt{5^2 + 6^2 - 2 * 5 * 6 \cos 100}$

$\boxed{x = 8.450} \to X$

Area of $\triangle 1 = \frac{1}{2}(5)(6)\sin 100$

$= \boxed{14.772} \to A$

Area of $\triangle 2 = \sqrt{s(s-x)(s-8)(s-7)}$

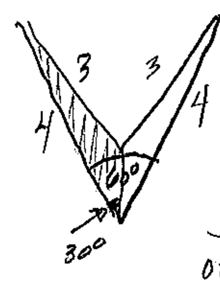
$s = \dfrac{x+7+8}{2}$

$= \boxed{25.998} \to B$

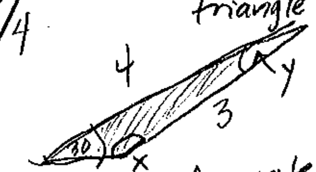
$s = 11.725 \to C$

Total Area = A+B = $\boxed{40.770}$

(b)



Focus on one triangle



obtuse SSA angle case

$\dfrac{\sin 30^\circ}{3} = \dfrac{\sin x}{4}$

$x = \sin^{-1}\left(\dfrac{4\sin 30}{3}\right)$

$x = 41.810 \leftarrow$ acute, so

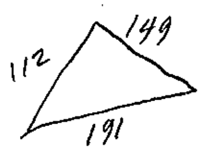
$x = 180 - 41.810\ldots = 138.189^\circ \to X$

$y = 180 - X - 30 = 11.810^\circ \to Y$

Area $= 2\left[\frac{1}{2}(3)(4)\sin Y\right]$

$= \boxed{2.456}$

(9)



$s = \dfrac{112+149+191}{2} = 226$

Area $= \sqrt{226(226-112)(226-149)(226-191)}$

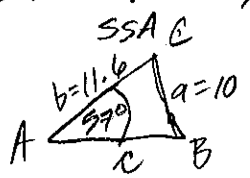
Area $= \boxed{8332.705 \text{ ft}^2}$

Value $= \dfrac{\$300}{\text{ft}^2}(8332.705 \text{ ft}^2)$

$= \boxed{\$2{,}499{,}811.63}$

(10) $A = 57^\circ, b = 11.6, a = 10$

SSA



$10^2 = 11.6^2 + c^2 - 2(11.6)c\cos 57^\circ$

$\underset{A}{1}c^2 - \underset{B}{\underbrace{(2(11.6)\cos 57^\circ)}}c + \underset{C}{\underbrace{(11.6^2 - 10^2)}} = 0$

$c = \dfrac{-B \pm \sqrt{B^2 - 4AC}}{2A} = 8.631 \to X$ or $4.003 \to Y$

Acute case

$\boxed{c = 8.631} \leftarrow X$

$\dfrac{\sin B}{11.6} = \dfrac{\sin 57}{10}$

$B = \sin^{-1}\left[\dfrac{11.6\sin 57}{10}\right]$

$\boxed{B = 76.620^\circ} \to B$

$C = 180 - 57 - B$

$\boxed{C = 46.379^\circ}$

OBTUSE case

$\boxed{c = 4.003}$

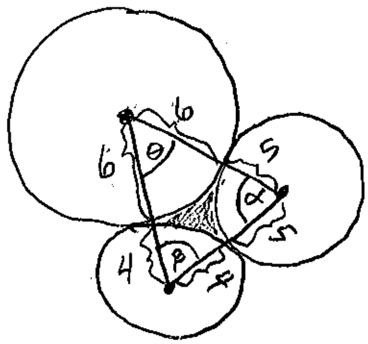
$B = 180 - 76.620\ldots$

$\boxed{B = 103.379^\circ} \to B$

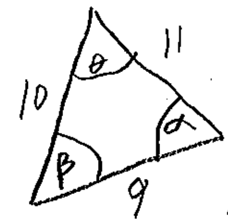
$C = 180 - 57 - B$

$\boxed{C = 19.620^\circ}$

(11)



Triangle Area



$s = \frac{10+11+9}{2} = 15$

$Area = \sqrt{15(15-10)(15-11)(15-9)}$

$Area = \boxed{42.426} \rightarrow A$

Area of Sectors

$A = \frac{1}{2}r^2\theta$ (θ in radians)

$Area(\theta) = \frac{1}{2}(6^2)\theta = \frac{1}{2}(6^2)(0.881..)$

$= 15.858 \rightarrow E$

$Area(\beta) = \frac{1}{2}(4^2)\beta = \frac{1}{2}(4^2)(1.230)$

$= 9.847 \rightarrow F$

$Area(\alpha) = \frac{1}{2}(5^2)\alpha = \frac{1}{2}(5^2)(1.029)$

$= 12.870 \rightarrow G$

Find Angles θ, α, β

$11^2 = 10^2 + 9^2 - 2*10*9\cos\beta$

$\beta = \cos^{-1}\left[\frac{11^2-10^2-9^2}{-180}\right]$

$\boxed{\beta = 70.528°} \rightarrow B$

$\frac{\sin\theta}{9} = \frac{\sin B}{11}$

$\theta = \sin^{-1}\left(\frac{9\sin B}{11}\right)$

$\boxed{\theta = 50.478°} \rightarrow C$

$\alpha = 180 - B - C$

$\boxed{\alpha = 58.992°} \rightarrow D$

You must convert these to radians, or find them in radians from the beginning.

*All angles must be in radians (mult by $\frac{\pi}{180}$)

$\beta = 70.528°\left(\frac{\pi}{180}\right) = \boxed{1.230} \rightarrow B$

$\theta = 50.478°\left(\frac{\pi}{180}\right) = \boxed{0.881} \rightarrow C$

$\alpha = 58.992\left(\frac{\pi}{180}\right) = \boxed{1.029} \rightarrow D$

Area of Shaded Region

= Area of Triangle − Sum of Sector Areas

$= A - (E + F + G)$

$= \boxed{3.850 \text{ in}^2}$