**LLOYD’S FORMULA for the area of any triangle with sides *a, b* and *c*.**

A

*c b*

B *a* C

*cosC = a2 + b2 – c2*

*2ab*

*Using sin2C = 1 – cos2C*

*sin2C = 1 – (a2 + b2 – c2)2*

*4a2b2*

*sin2C = 4a2b2 – (a2 + b2 – c2)2*

*4a2b2*

*sinC = √ (4a2b2 – (a2 + b2 – c2)2 )*

*2ab*

*Area of ΔABC = absinC*

*2*

*= ab √ (4a2b2 – (a2 + b2 – c2)2 )*

*2 2ab*

***AREA = √ (4a2b2 – (a2 + b2 – c2)2 )***

***4***

*Checks (with a, b and c in differing combinations):*

***a=3 b=5 b=3 c=5***

***c=4 a=4***

***Area = √(4×9×25 – (9+25–16)2) Area = √(4×16×9 – (16+9–25)2)***

***4 4***

***=√(900 – 182) = √(576 – (0)2***

***4 4***

***= √ 576 = √ 576***

***4 4***

***= 6 = 6***

***a=√3 c=2***

***a=1 c=√2***

***b=1 b=1***

***AREA = √ (4a2b2 – (a2 + b2 – c2)2 ) AREA = √ (4a2b2 – (a2 + b2 – c2)2 )***

***4 4***

***= √ ( 4 – (1 + 1 – 2)2 ) = √(4×3×1 – (3 + 1 – 4)***

***4 4***

***= ½ = √12***

***4***

***= 2√3 = √3***

***4 2***

***a=1 b=1 c=12 b=5***

***c=1 a=13***

***AREA = √ (4a2b2 – (a2 + b2 – c2)2 ) AREA = √ (4a2b2 – (a2 + b2 – c2)2 )***

***4 4***

***= √ 4 – 12 = √(16900 – (50)2 )***

***4 4***

***= √3 = √14400 = 120 = 30***

***4 4 4***

***ie same as bh = 5×12 = 30***

***2 2***

***SPECIAL NOTE:***

***AREA = √ (4a2b2 – (a2 + b2 – c2)2 )***

***4***

***Expanded = √(a4 + b4 +c4 + 6a2b2 – 2a2c2 – 2b2c2)***

***4***

***and with great effort this could be factorised to make Heron’s formula:***

***Area = √ (a + b + c)(b + c – a)(a + c – b)(a + b – c)***

***4***

***= √ (a+b+c) (a+b+c – a) (a+b+c – b) (a+b+c – c)***

***2 2 2 2***

***= √ s (s – a) (s – b) (s – c) where s = (a + b + c)***

***2***