Formulas & Identities from Trigonometry:

1. $A^2 + B^2 = C^2$ (*Pythagorean Theorem*)

2. $\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$

3. $\sin 2A = 2 \sin A \cos A$ (*Follows from #2; let A=B.*)

4. $\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$

5. $\sin^2 A + \cos^2 A = 1$ *("Pythagorean" Identity)*

6. $\cos 2A = \cos^2 A - \sin^2 A$ (Follows from #4; let A=B.)

7. $\cos 2A = 2\cos^2 A - 1$ (*Solve for* ***sin²A*** *in #5; substitute in #6.*)

8. $\cos 2A = 1 - 2\sin^2 A$ (*Solve for* ***cos²A*** *in #5; substitute in #6.*)

9. $1 + \cot^2 A = \csc^2 A$ (*Divide identity #5 by* ***sin²A*** *to get this one.*)

10. $\tan^2 A + 1 = \sec^2 A$ (*Divide identity #5 by* ***cos²A*** *to get this one.*)

11. $\tan A = \dfrac{\sin A}{\cos A}$; 12. $\cot A = \dfrac{\cos A}{\sin A}$; 13. $\sec A = \dfrac{1}{\cos A}$; 14. $\csc A = \dfrac{1}{\sin A}$

15. $\sin\left(\frac{1}{2}A\right) = \pm\sqrt{\tfrac{1}{2}(1 - \cos A)}$

(*In #15, "+" sign chosen if* ***½A*** *is in the 1st or 2nd quadrant;*
"–" sign chosen if ***½A*** *is in the 3rd or 4th quadrant.*)

16. $\cos\left(\frac{1}{2}A\right) = \pm\sqrt{\tfrac{1}{2}(1 + \cos A)}$

(*In #16, "+" sign chosen if* ***½A*** *is in the 1st or 4th quadrant;*
"–" sign chosen if ***½A*** *is in the 2nd or 3rd quadrant.*)

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

(*Law of Sines, where* ΔABC *has angles A, B, & C and side "a" is opposite angle A, side "b" is opposite angle B, and side "c" is opposite angle C.*)

18. $c^2 = a^2 + b^2 - 2ab(\cos C)$

(Law of Cosines, where A, B, C, a, b, & c are described in #17.)

19. $a = \theta r$ (*a = arc of circle, r = radius,* θ *= inscribed angle*)

20. $a = \tfrac{1}{2} r^2 \theta$ (*a = area of sector, r = radius,* θ *= angle in sector*)

21. $a_t = \tfrac{1}{2}ab(\sin C)$ (a_t **=** *area of triangle; a,b, & C are described in identity #17.*)

22. $a_t = \sqrt{s(s-a)(s-b)(s-c)}$ (*s = semi-perimeter = one-half of the perimeter of a triangle = ½(a + b + c) where a, b, & c are described in identity #15.*
a_t **=** *area of triangle. This formula is known as Hero's Formula.*)