

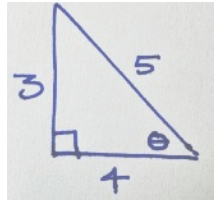
Summer Packet for Students Entering **Calculus** (AP and level 2)

I. Trigonometry (SOHCAHTOA)

① Find $\cos \theta$

② Find $\tan \theta$

③ Find $\sin \theta$



④ Evaluate (using the unit circle):

a) $\sin\left(\frac{\pi}{4}\right)$

b) $\cos\left(\frac{3\pi}{2}\right)$

c) $\tan\left(\frac{5\pi}{6}\right)$

d) $\sin\left(\frac{4\pi}{3}\right)$

e) $\tan\left(\frac{7\pi}{4}\right)$

f) $\cos\left(\frac{7\pi}{6}\right)$

II. Logarithms

Conversion: $\log_b a = x \Leftrightarrow b^x = a$

⑤ Evaluate:

a) $\log_2 8$

b) $\log_{25} 5$

c) $\log_9 27$

d) $\log_6 \frac{1}{36}$

⑥ Expand:

a) $\log_2\left(\frac{8x^3y^2}{\sqrt{z}}\right)$

b) $\ln(5e^4a^5)$

⑦ Condense:

a) $3 \log_4 a + \frac{1}{2} \log_4 b - 5 \log_4 c$

b) $\frac{1}{3}(\ln(x) + \ln(y)) - 4 \ln(z)$

⑧ Solve for x:

a) $\log_x 64 = 3$

b) $\log_7 x = 2$

III. Rational equations

⑨ $\frac{2}{x} + \frac{4}{3x} = \frac{x+1}{x}$

⑩ $\frac{3}{x+1} + \frac{2}{x-2} = \frac{8}{x+1}$

$$\textcircled{11} \quad \frac{x+1}{x-3} - \frac{x+2}{x^2-x-6} = \frac{-8}{x+2}$$

IV. Compounding interest/depreciation word problems

$\textcircled{12}$ Mr. White is a chemistry teacher at JP Wynne High School. He's recently come into some health problems, so he's recruited a former student, Jesse, to help him cook up a solution to his financial problem. Currently, Mr. White has \$2,575 in his Albuquerque Savings account. If the bank compounds interest quarterly at a rate of 2.5%, how much will he have in his account in four years? Hint: compounding interest formula is $A = P\left(1 + \frac{r}{n}\right)^{nt}$

$\textcircled{13}$ Mr. White and Jesse have purchased an RV to assist in their new enterprise. They purchased it for \$4,500. Since Mr. White likes to do everything "by the book," he'll be depreciating this asset on his annual tax return. If the RV depreciates at an annual rate of 20%, what will it be worth in 4 years? Hint: depreciation (exponential decay) formula is $A = P(1 - r)^t$

V. Systems of Equations: Word Problems (solve by method of your choice)

- ⑭ Business is booming! Mr. White and Jesse are building their empire selling two different highly sought after products: Crystal Clear and Blue Ice. They have 772 exhausting hours to work, straight through, making the next batch of their products. On average, it takes 3 hours to curate each bag of Crystal Clear and 7 hours to make each bag of Blue Ice (with 99%+ clarity, mind you). How many bags of each can the artists create within this time frame in order to come up with what they need for next weeks sales of 120 bags (they are serving the greater part of Albuquerque at this point)? Hint: make x the number of bags of Crystal Clear and y the number of bags of Blue Ice. Make a system, with one equation involving total bags they need and the other the hours they need to make it
- ⑮ Recently, Mr. White and Jesse have brought on some sales associates, Skinny Pete and Badger, to help them move product and refine their distribution chain. Since Pete and Badger aren't the most responsible salesmen, they don't do a great job of logging exact sales of the two products. Mr. White knows that 27 total bags left the RV on Friday morning and the boys brought back a total of \$3,525 that night. If Crystal Clear sells for \$25 per bag and Blue Ice sells for \$175 per bag, how much of each did they sell? Hint: make x the total bags of Crystal Clear sold and y the total amount of Blue Ice. Make a system of equations and solve

VI. Exponential word problems

- ⑩ The boys business has invaded Mexico! With the help of Mr. Fring, and Don Eladio, their product (since margins are much greater for Blue Ice, they've gone all in and made this their flagship) is in high demand. Mr. White, being the numbers guy, wants to find out how many customers he'll have if the current exponential growth continues for the next two years. He figures he has about 950 customers currently and his product is so good (his most glowing reviews call it better than caffeine) that his customer base will double every 3 months. Using the equation $y = 950(2)^{\frac{m}{3}}$, where y is the number of customers and m is the number of **months**, calculate the total number of customers Mr. White and Jesse will have after two years.
- ⑪ Uh oh...along with the success of the business, comes a giant pile of money. Since their product isn't legal (let's say) in most states, the money they bring in needs to be "cleaned." With the help of their friend and confidante, Mr. Saul Goodman, the boys come up with a plan to legitimize the funds. Mrs. White has opened up a car wash and is slowly depositing the cash into the wash's general fund. Mr. White is getting a bit impatient as the pile seems to be continuously growing. Mrs. White says, "I'm going as fast as I can! I'm depositing 5% of the pile per week!" If the pile started at 1,700 pounds and it's shrinking by 5% per week, how big will it be after 1 year? Hint: there are 52 weeks in a year. Use the exponential decay formula $A = P(1 - r)^t$

VII. Even, odd, neither symmetry (find $f(-x)$, if $f(x)$ and $f(-x)$ are equal the function is even. If $f(x)=-f(-x)$ the function is odd. Otherwise, no symmetry)

⑱ $f(x) = x^2 - 6$

⑲ $f(x) = -5x^3 + 4x$

⑳ $f(x) = 4x^2 - 8x + 7$

VIII. Simplifying radicals

㉑ $\sqrt{20x^2y^7}$

㉒ $\sqrt{\frac{8a^7b^9}{2ab^5}}$

㉓ $-2\sqrt{72x^6y^9z^2}$

IX. Simplifying exponents (simplified expressions should have positive exponents)

㉔ $\frac{6x^2y}{2xy^5}$

$$\textcircled{25} \quad \frac{-9a^{-2}b^0c^5}{6a^3b^{-3}c^7}$$

X. Composition of functions (hint: $f(x) \circ g(x) = f(g(x))$)

$$f(x) = x^2 + 2x - 1 \quad g(x) = x - 3$$

$$\textcircled{26} \quad g(x) \circ f(x)$$

$$\textcircled{27} \quad f(x) \circ g(x)$$

XI. Factoring

$$\textcircled{28} \quad x^2 - 13x - 48$$

$$\textcircled{29} \quad 4a^2 - 25$$

$$\textcircled{30} \quad 3b^2 - 8b + 4$$

$$\textcircled{31} \quad h^3 - 8$$

$$\textcircled{32} \quad d^3 + 27$$

XII. Square root equations (check for extraneous solutions!)

③ $\sqrt{x+3} = \sqrt{7-x}$

④ $\sqrt{x-2} + 4 = x$

XIII. Quadratic inequalities (solve for x by factoring and set up a sign chart)

⑤ $x^2 - 7x - 18 < 0$

⑥ $x^2 + 5x > 14$