MENTAL MATH SHORTCUTS

Heres a collection of time-saving math shortcuts, great for back-of-the-envelope estimates.

TIME AND DISTANCE 60 mph = 1 mile per minute Going 60 mph and the exit is in 10 miles? Thats 10 minutes. Been driving a half hour? Thats about 30 miles at highway speeds. Feet Per Second = MPH \* 1.5 MPH = Feet Per Second \* 2/3 (derivation) 60 mph is about 90 feet per second (88 exactly), so just multiply by 1.5. Or, just add half to itself (60 + 30 = 90). Going 100 mph? Thats 150 fps. Going 10 fps? Thats about 7 mph (10 \* 2/3 is 6.666). Or, just take away 1/3 (10 - 3 = 7). speed of light = 1 foot per nanosecond (derivation) The US is about 3000 miles long. Theres about 5000 feet/mile, so thats about 3000 × 5000 or 15 million feet. 15 million feet takes 15 million nanoseconds, or 15/1000, or 15 milliseconds. Thats the minimum time for a signal to go across the country. Inside a microchip, if you have a clock cycle every nanosecond (1 GHz), your signal can only travel 1 foot at most (or less, depending on the material). Even light takes 30ns to cross a 30 foot room. 1 year = 250 work days = 2000 work hours (derivation) Project takes 1000 man hours? Thats 6 months for 1 person. Daily commute of 1/2 hour? Thats .5 \* 250 = 125 hours in the car each year. MONEY AND FINANCE \$1/hour = \$2000/year (derivation) Earn \$25/hour? Thats about 50k/year. Make 200k/year? Thats about \$100/hour. This assumes a 40-hour work week. \$20/week = \$1000/year (derivation) Spend \$20/week at Starbucks? Thats a cool grand a year. Rule of 72: Years To Double = 72/Interest Rate (derivation) Have an investment growing at 10% interest? It will double in 7.2 years. Want your investment to double in 5 years? You need 72/5 or about 15% interest. Growing at 2% a week? Youll double in 72/2 or 36 weeks. You can use this rule for any duration of time, not just years. Inflation at 4%? It will halve your money in 72/4 or 18 years. NUMBERS 10,000 = hundred X hundredmillion = thousand X thousand billion = thousand X million trillion = million X million 1% of 10k is 100. The Dow is roughly 10k (its about 12k now). So if the dow drops 100, its about a 1% loss.

Whats 5k x 50k? Thats 250 \* thousand \* thousand or 250 million. Visualizing numbers (read more) 12 days = 1 million seconds 1 year = 31 million seconds (about pi \* 10 million) 30 years = 1 billion seconds 30,000 years = 1 trillion seconds One "part per million" means an accuracy of 1 second every 12 days. One "part per trillion" means an accuracy of 1 second every 30,000 years. (Powers of 2)  $2^6 = 64$  (the sixes match: six and sixty-four)  $2^{10} \sim$  thousand (1 kb) 2^20 ~ million (1 mb) 2^30 ~ billion (1 gb) Sure, 2 to the tenth = 1024, but 1000 is good enough for government work. (Read on about KB vs KiB). Have 32-bit color? Thats 2 + 30 bits =  $2^2 * 2^{30} = 2^{2}$  billion = 4 billion (4gb exactly). Have a 16-bit number? Thats 6 + 10 bits, or 2^6 thousand, or 64 thousand (64 kb). a% of b = b% of aIts not immediately clear, but its true: a% of b = .01 \* a \* b, which is the same as b% of a (.01 \* b \* a). Whats 16% of 25? The same as 25% of 16: 4 Whats 43% of 200? Same as 200% of 43: 86. MULTIPLICATION (TWO DIGIT NUMBER TIMES A SINGLE DIGIT NUMBER) This method is explained for "1" at the ten's place of two digit number (Times Table) Steps to be followed to understand the above shortcut : Step 1 : First take the single digit number and multiply it by 10. (7x10 = 70 in the above example) Step 2 : Multiply the single digit and unit digit of the two digit number  $(7 \times 2 = 14 \text{ in the above example})$ Step 3 : Add step 1 value and step 2 value. (70+14 = 84 in the above example)That's it.

Try yourself :

MULTIPLICATION (TWO DIGIT NUMBER TIMES A TWO DIGIT NUMBER)

This method is explained for "1" at the ten's place of both the two digit numbers (Times Table)

Method 1 :

Method 2 :

Steps to be followed to understand both the methods:

Step 1 :

First take one of the two digit numbers and multiply it by 10.

Step 2 :

Multiply the unit digit of other two digit number by 10.

Step 3 :

Multiply unit digits of both the numbers.

Step 4 :

Add all the above three values and you will get answer.

That's it

Try yourself:

17x18 = ? 18x19 = ? 15x19 = ?