

Using Factoring For Mental Math Shortcuts

For many years, I have used factoring to simplify multiplying and dividing in my head. You could call this “Multiplying and Dividing in Parts”. Here are some examples of multiplying:

- (1) $56 \times 4 = 56 \times (2 \times 2)$, so double and double: $56 \times 2 = 112$, $112 \times 2 = 224$.
- (2) $34 \times 8 = 34 \times (2 \times 2 \times 2)$, so double, double and double: $34 \times 2 = 68$, $68 \times 2 = 136$, $136 \times 2 = 272$. Pretty soon you can just read off the answers as: 68, 136, and 272.
- (3) $21 \times 16 = 21 \times (2 \times 2 \times 2 \times 2)$, so double, double, double and double: 42, 84, 168, 336.
- (4) $45 \times 6 = 45 \times (2 \times 3)$, so double and then triple: $45 \times 2 = 90$, $90 \times 3 = 270$. Soon, you will be looking for this technique all the time instead of reaching for your calculator!
- (5) $82 \times 24 = 82 \times (3 \times 2 \times 2 \times 2)$, so triple, and then double, double and double: $82 \times 3 = 246$, $246 \times 2 = 492$, $492 \times 2 = 984$, and $984 \times 2 = 1968$, or 1 968. Another shortcut I used here is when I did something like 246×2 , I knew 2 x the 6 would cause me to carry a 1, so I did 24×2 first to get 48 and then added the 1 to get 49. I knew 2 x the 6 would end in a “2”, so I just attached a “2” to “49” to get 492. In other words, I really multiplied sort of from left to right, with a “look ahead” to see what I was going to have to carry. When I am multiplying by 2, I will never have to carry more than a “1”.
- (6) Earlier in these sessions (Saturday, March 7, 2009), I showed a trick for multiplying by 11. I can use that trick when multiplying by things like 22, 33, 44, etc. For instance $13 \times 22 = 13 \times (2 \times 11)$, so $13 \times 2 = 26$, and, using the multiplying by 11 trick, $26 \times 11 = 286$. (Write down 2 __ 6, add up the 2 and the 6, and put the answer in the middle to get 2 **8** 6).
- (7) I watch a lot of International Rugby, and quite often the weights of the players are given in Kilograms (Kg), whereas I am used to Pounds (lb.). The conversion is $1 \text{ Kg} = 2.2 \text{ lb}$. So, if a Prop’s weight is given as 115 kg, think $115 \times 2.2 = 115 \times (2 \times 11 \div 10) = 115 \times 2 = 230$, $230 \times 11 = 2530$ and $2530 \div 10 = 253 \text{ lbs}$. With a bit of practice, this works very quickly by combining two of our tricks together.

Here are some examples of dividing: First break up the divisor into its factors, then divide continuously by each of the factors until you divided by all of them.

- (1) $148 \div 4 = 148 \div (2 \times 2) = 148 \div 2 \div 2$. So $148 \div 2 = 74$, and $74 \div 2 = 37$.
- (2) $840 \div 16 = 840 \div (4 \times 2 \times 2) = 840 \div 4 \div 2 \div 2$, so $840 \div 4 = 210$, $210 \div 2 = 105$, and $105 \div 2 = 52.5$.
- (3) $390 \div 6 = 390 \div (3 \times 2) = 390 \div 3 \div 2$, so $390 \div 3 = 130$, and $130 \div 2 = 65$.
- (4) $352 \div 22 = 352 \div (11 \times 2) = 352 \div 11 \div 2$, so $352 \div 11 = 32$, and $32 \div 2 = 16$. This uses the divide by 11 trick that we saw on Saturday, March 7, 2009.
- (5) $8127 \div 27 = 8127 \div (3 \times 3 \times 3) = 8127 \div 3 \div 3 \div 3$, so $8127 \div 3 = 2709$, and $2709 \div 3 = 903$, and $903 \div 3 = 301$.