Using $A=p(r+1)^t$

Definitions:
Principal is an amount of money invested or borrowed.
Rate is the speed at which money changes in quantity, positively or negatively.
Compounding Interest is the mechanism by which money is earned exponentially.

Formula:
$A=p(r+1)^t$

'A' is the total amount of money.
'p' is the principle.
'r' is the rate (added to 1)
't' is the time money is invested or borrowed.

Deposits:
Mariah deposits $500 in her savings account and leaves it for ten years at a rate of 3%.

Formula: $500(1.03)^{10} =$ Total: 672.12

Fobert opens a $1200 money-market account yielding 6% interest over a period of 12 years.

Formula: $1200(1.06)^{12} =$ Total: 2,414.64

McKayla purchases a $5,000 certified deposit with a guaranteed interest rate of 5.7% for 5 years.

Formula: $5000(1.057)^{5} =$ Total: 6,596.98

Borrowing:
Travis borrows $10,000 at a rate of 12% and does not pay back the money for 7 years.

Formula: $10{,}000(1.12)^{7} =$ Total: 22,106.81

Avery puts $8,300 on her credit card at 22.75% interest and ignores it for four years.

Formula: $8300(1.2275)^{4} =$ Total: 18,843.61

Kyle and Courtney's parents borrow $275,000 on a 30-year mortgage at a fixed interest rate of 3½%.

Formula: $275{,}000(1.035)^{30} =$ Total: 771,868.29

All three instances give us a principle, an interest rate and an amount of time. Most of us are comfortable with dollars and also with years, the interest rate causes the greatest trouble for students. With the 3% we need to remember that the interests as a decimal is .03, that is because percent means "per-one-hundred." Three divided by one-hundred is .03. If we say ".3" that is equal to .30 or 30%.
The 6% listed is the same as .06... same reasons as before.
The 5.7% is the decimal .057.

This set of examples is interesting and we see money being borrowed. We can work with borrowed mone either as $10,000 or -$10,000. Either work, but if I say $10,000 I need to point out that it is borrowed and like a negative, needs to be paid back.

Also, this example points out that most borrowed money accrues interest much faster than deposited money (how sad). It really never works to borrow money to invest.

Investments:

Damon invests $20,000 of savings in a mutual fund with an average interest rate of 13.4% for twenty years of his working life.

Formula: $20{,}000(1.134)^{20} =$ Total: 247,338.14

Alison's parents sell their share of a beach cabin for $75,000 and invest the money in an index fund with an average interest rate of 11 $^{1}/_{5}$ % *for a period of twenty-five years.*

Formula: $75{,}000(1.112)^{25} =$ Total: 1,065,812.83

This new set of examples deals with higher yield investments such as in mutuals, index funds, other higher risk investments. In class it was said that you never want too much of your money in one place. "One place" fails given enough time. Everywhere never fails.

The set-up on these items was just like on the previous examples. These were more fun though since we made more money!

Missing Values:

Flavio's Mom and Dad put $2,500 away in an annuity when he was born to be kept until he is older. The annuity earns 4 $^{3}/_{4}$% interest anually. How long does it take to reach $5,000?

Formula: $2500(1.0475)^{x}$ Time: $x = 15$

Mbassey wants to have a million dollars. If she puts her $50,000 inheritance into a 15% high-yield investment, how long will it take to get a million out?

Formula: $50{,}000(1.15)^{x}$ Time: $x = 22$

Bryce needs wants to have $25,000 in ten years. He figures he can get a 12% return on an investment. How much would he have to invest right now at that rate?

Formula: $25000 = (1.12)^{10} * P$ Principal: $P = 8048.94$
$\div 3.106 \quad \div 3.106$

Jexx got the idea that his high school job could be worth a bunch more if enhanced by time. His index fund earned 13.8% over twenty years yielding a total of $55,465.32. How much did he originally invest?

Formula: $55465.32 = (1.138)^{20} * P$ Principal: $P = 4180$
$\div 1.138^{20} \quad \div 1.138^{20}$

Kalea got inspired when she was twenty and set up a plan to invest $10,000 at a modest rate for thirty years. Knowing that her investment turned into $87,549.55, what was the interest rate?

Formula: $87549.55 = 10{,}000(1+r)^{30}$ Rate: $r = 7.5\%$
$\div 10000 \quad \div 10000$
$8.755 \wedge (1/30)$ 1.075

Hint: use the $\wedge(^{1}/_{t})$ trick!

The Flavio question was a little tougher because it was missing the time. We found a good way to solve this was to use the table-feature in the calculator and hunt down the x-value (or t-value) that gave us the desired amount.

The Mbassey item points out that we can turn 50k into a million but it will take time. 15% is a very good rate and not all aggressive mutuals can match it. But an average rate that high will cause money to explode in volume if we are patient. The table will help us find the time.

Bryce's question includes all the information except the principle. In this case we solve the equation down until only the variable 'p' is left.

Jexx' question is just like Bryce's. Principle is missing and the equation has to be simplified to find it.

Kalea has the toughest item. With a missing rate there are only a couple ways to force the exponent to show itself. Once I simplified the equation I used the fraction-exponent.