Exponential Growth

and Money


RESERVE NOTE
361663 D
IS LEGAL TENDER
, PUBLIC AND PRIVATE
of the United States.
SERIES
2006
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H 353
KF 183616
Secretary of the Treasury.
FRANKLIN


Interest


+ % =

Simple Interest

- ➔ Mostly used in casual situations

- ➔ Also used in the bond market and for some short-term loans

Simple Interest

- ➔ Interest is paid ONLY on the base amount of money (the principal)
- ➔ The same amount of interest is paid each time.

$100 investment → 3% simple interest

Year	Interest Earned	Total
1	$3	$103
2	$3	$106
3	$3	$109
4	$3	$112
5	$3	$115

Simple Interest Formulas

$$\mathrm{I} = Prt$$

$$A = P + I \text{ or } A = P + Prt$$

You lend your brother $350. If he pays the loan back 2 years later, how much will he owe you if you charge 5% interest?

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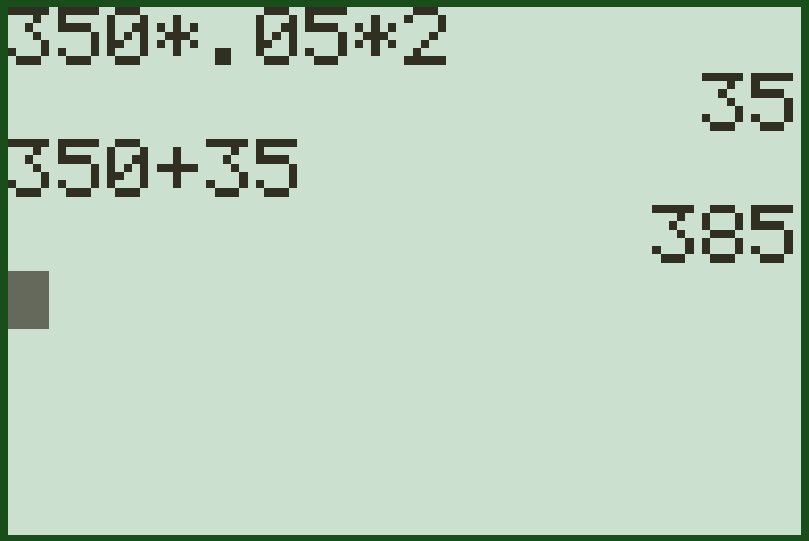

An appliance store charges 4% simple interest on purchases that aren't paid immediately. If you buy an $800 stove, how much interest will you owe if you pay for the purchase 6 months later?

r = .04

P = 800

t = ½

800*.04*.5

16

A bond matures 20 years after it is purchased. If its value at maturity is $500 and the bond earned 2% annually, how much was the purchase price?

$$A = P + Prt$$

$$500 = P + P * .02 * 20$$

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$$A = P + Prt$$
$$500 = P + P * .02 * 20$$
$$500 = 1P + .4P$$
$$500 = 1.4P$$
$$\$357.14 = P$$

Simple interest
is **NOT**
exponential growth.

Compound Interest

- Used in most financial transactions

- Interest is paid both on the principal **AND** on interest that has already been earned

$100 investment → 3% compound interest

Year	Interest Earned	Total
1	$3	$103.00
2	$3.09	$106.09
3	$3.18	$109.27
4	$3.28	$112.55
5	$3.38	$115.93

Compound Interest

- ➔ Each year you earn more interest than the year before

- ➔ Growth is **exponential**.

Compound Interest Formula

$$A = P\left(1 + \frac{r}{n}\right)^{(nt)}$$

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A = Accumulation (final amount)
P = Principal (starting amount)
r = Rate of interest (decimal)
t = Time (years)

$$A = P\left(1 + \frac{r}{n}\right)^{(nt)}$$

n = number of times compounded per year

Annually = 1

Semiannually = 2

Quarterly = 4

Monthly = 12

Weekly = 52

Daily = ?????

Daily

→ In modern times usually 365

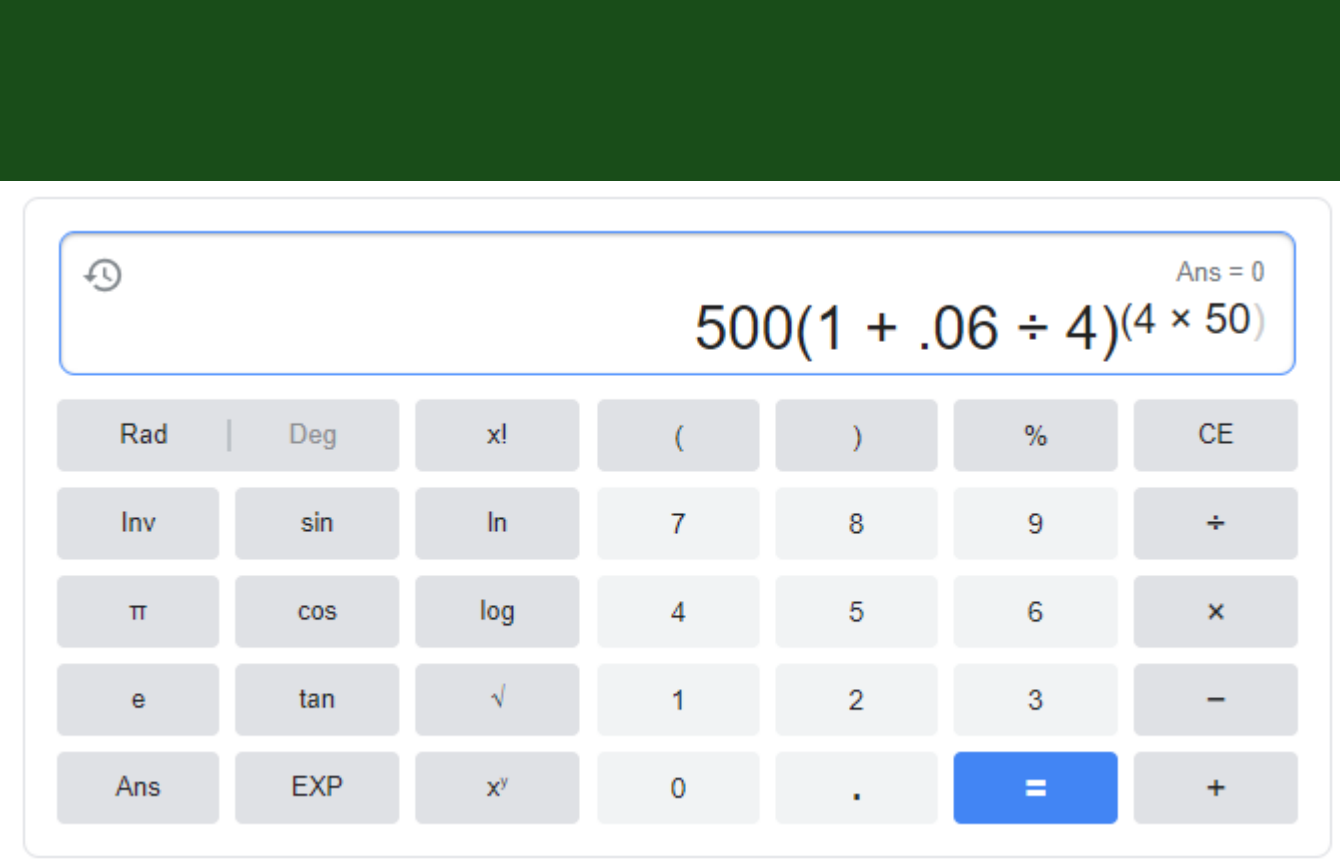
→ Traditionally 360

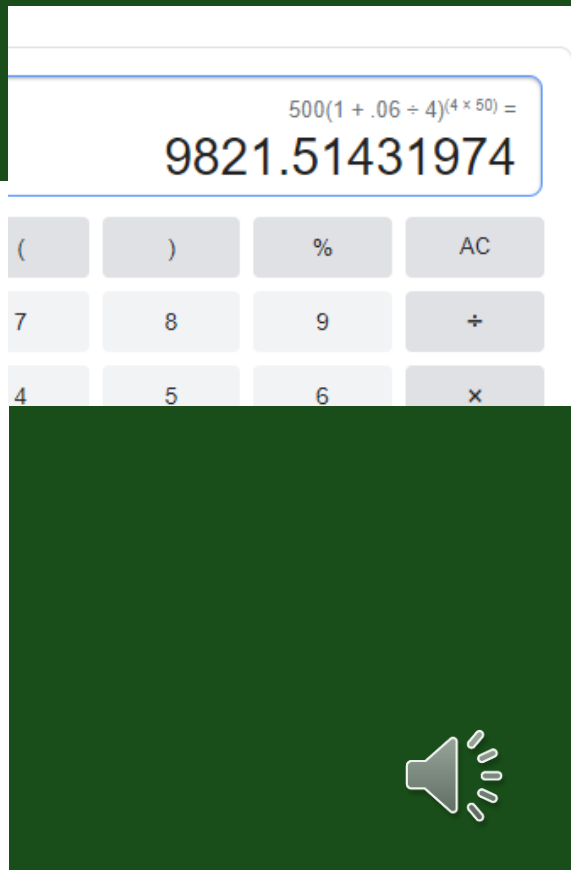
→ Sometimes 366 or 365.25

Families will supposedly get a $500 payment from the government for each child they have as an economic stimulus due to the Coronavirus pandemic.

Suppose your parents let you invest your $500. You find an account that will pay 6% interest, compounded quarterly. How much money will you have 50 years from now?

$$A = 500\left(1 + \frac{.06}{4}\right)^{(4*50)}$$





$$A = 500\left(1 + \frac{.06}{4}\right)^{(4*50)}$$

```
500(1+.06/4)^(4*
50)
        9821.51432
```

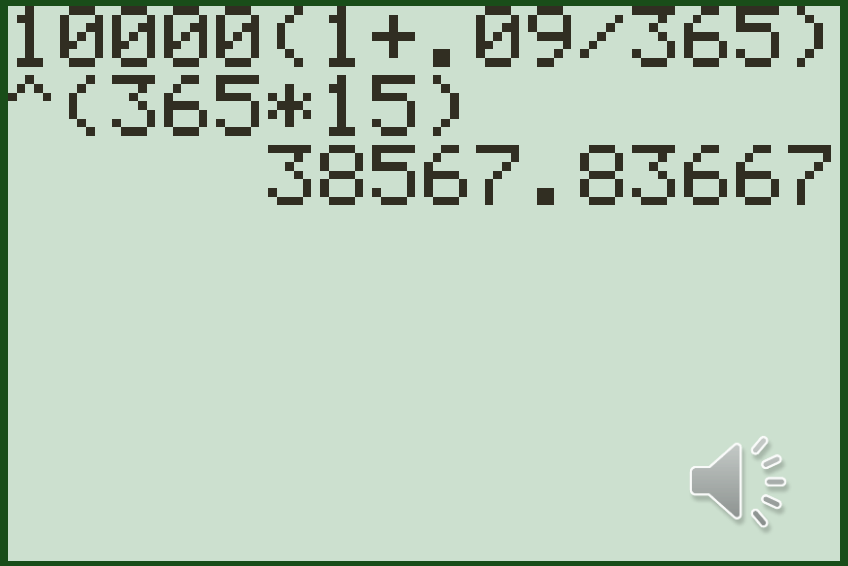
```
1+.06/4
             1.015
Ans^200
      19.64302864
Ans*500
      9821.51432
```

$$A = 500\left(1 + \frac{.06}{4}\right)^{(4*50)}$$

$9821.51

A $10,000 investment earns 9% interest compounded daily. How much will it be worth in 15 years?

$$A = 10000\left(1 + \frac{.09}{365}\right)^{(365*15)}$$



$$A = P\left(1 + \frac{r}{n}\right)^{(nt)}$$