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ECONOMICS

ECONOMICS-1

How is the capital recovery factor $(A/P, i, n)$ related to the uniform series sinking fund factor $(A/F, i, n)$? i is the effective annual rate of return, and n is the number of periods.

(A) $(A/P, i, n) = (A/F, i, n) + i$

(B) $(A/P, i, n) = (A/F, i, n) - i$

(C) $(A/P, i, n) = \dfrac{(A/F, i, n)}{i}$

(D) $(A/P, i, n) = \dfrac{(A/F, i, n) + i}{n}$

By definition,
$$(A/P, i, n) = (A/F, i, n) + i$$

> The answer is (A).

ECONOMICS-2

What is an annuity?

(A) the future worth of a present amount
(B) an annual repayment of a loan
(C) a series of uniform amounts over a period of time
(D) a lump sum at the end of the year

> The answer is (C).

ECONOMICS-3

Which of the following expressions is INCORRECT?

(A) The future worth of a present amount, $(F/P, i, n), = \dfrac{1}{(P/F, i, n)}$

(B) The future worth of an annuity, $(F/A, i, n), = \dfrac{1}{(A/F, i, n)}$

(C) The present worth of an annuity, $(P/A, i, n), = \dfrac{1}{(A/P, i, n)}$

(D) $(A/F, i, n) - i = (A/P, i, n)$

$$(A/F, i, n) + i = (A/P, i, n)$$

Therefore, option (D) is false.

The answer is (D).

ECONOMICS-4

When using net present worth calculations to compare two projects, which of the following could invalidate the calculation?

(A) differences in the magnitudes of the projects
(B) evaluating over different time periods
(C) mutually exclusive projects
(D) nonconventional cash flows

Options (A), (C), and (D) are all problems with internal rate of return calculations that net present worth handles nicely. However, the net present worth of two projects must be calculated for the same time period.

The answer is (B).

ECONOMICS-5

What is most nearly the present worth of a $100 annuity over a 10 yr period if the interest rate is 8%?

(A) $450   (B) $530   (C) $670   (D) $700

$$P = A(P/A, i, n)$$
$$= (\$100)(P/A, 8\%, 10)$$
$$= (\$100)(6.71)$$
$$= \$671 \quad (\$670)$$

The answer is (C).

ECONOMICS-6

With a 12% interest rate, approximately how much money must be invested today in order to withdraw $1000 per year at the end of each year for 10 yr?

(A) $4800   (B) $5650   (C) $5800   (D) $6150

$$P = A(P/A, i, n)$$
$$= (\$1000)(P/A, 12\%, 10)$$
$$= (\$1000)(5.650)$$
$$= \$5650$$

The answer is (B).

ECONOMICS-7

A machine is under consideration for purchase. The cost of the machine is $25,000. Each year it operates, the machine will generate a savings of $15,000. Given an effective annual interest rate of 18%, what is the discounted payback period on the purchase in the machine?

(A) 1.67 yr   (B) 1.75 yr   (C) 2.15 yr   (D) 3.17 yr

$$P = A(P/A, i, n)$$
$$= A\left(\frac{(1+i)^n - 1}{i(1+i)^n}\right)$$

Substituting,

$$\$25{,}000 = (\$15{,}000)\left(\frac{(1+0.18)^n - 1}{(0.18)(1+0.18)^n}\right)$$

$$(0.3)(1.18)^n = 1.18^n - 1$$

$$(0.7)(1.18)^n = 1$$

$$n = \frac{\ln\dfrac{1}{0.7}}{\ln 1.18}$$

$$= 2.15 \text{ yr}$$

The answer is (C).

ECONOMICS-8

What is the present worth of two \$100 payments at the end of the third and fourth years if the annual interest rate is 8%?

(A) \$122   (B) \$153   (C) \$160   (D) \$162

$$P = A(P/A, i, n)$$

$$= (\$100)\big((P/A, 8\%, 4) - (P/A, 8\%, 2)\big)$$

$$= (\$100)(3.31 - 1.78)$$

$$= \$153$$

The answer is (B).

ECONOMICS-9

Consider a project that involves the investment of \$100,000 now and \$100,000 at the end of year 1. Revenues of \$150,000 will be generated at the end of years 1 and 2. What is most nearly the net present value of this project if the effective annual interest rate is 10%?

(A) \$43,300   (B) \$50,900   (C) \$69,500   (D) \$78,500

$$P = -\$100{,}000 + (\$150{,}000 - \$100{,}000)(P/F, 10\%, 1) + (\$150{,}000)(P/F, 10\%, 2)$$

$$= -\$100{,}000 + (\$50{,}000)(0.9091) + (\$150{,}000)(0.8264)$$

$$= \$69{,}415 \quad (\$69{,}500)$$

> The answer is (C).

ECONOMICS-10

At an annual rate of return of 8%, what is the future worth of $100 at the end of year 4?

(A) $130   (B) $132   (C) $135   (D) $136

$$F = A(F/A, i, n)$$
$$= (\$100)(F/P, 8\%, 4)$$
$$= (\$100)(1.3605)$$
$$= 136.05 \quad (\$136)$$

> The answer is (D).

ECONOMICS-11

A person invests $450 to be collected in 8 yr. Given that the interest rate on the investment is 14.5%/yr, compounded annually, most nearly what sum will be collected 8 yr from now?

(A) $1050   (B) $1130   (C) $1240   (D) $1330

$$F = A(F/P, i, n)$$
$$= (\$450)(F/P, 14.5\%, 8)$$
$$= (\$450)(2.954)$$
$$= \$1329 \quad (\$1330)$$

> The answer is (D).

ECONOMICS-12

An investment of x dollars is made at the end of each year for 3 yr, at an interest rate of 9% per year compounded annually. What will the dollar value of the total investment be, most nearly, upon the deposit of the third payment?

(A) $0.77x$ (B) $1.3x$ (C) $2.3x$ (D) $3.3x$

$$F = A(F/A, i, n)$$
$$= A\left(\frac{(1+i)^n - 1}{i}\right)$$
$$= x\left(\frac{(1+0.09)^3 - 1}{0.09}\right)$$
$$= \$3.278x \quad (\$3.3x)$$

The answer is (D).

ECONOMICS-13

If $500 is invested at the end of each year for 6 yr at an effective annual interest rate of 7%, what is most nearly the total dollar amount available upon the deposit of the sixth payment?

(A) $3000   (B) $3210   (C) $3580   (D) $4260

$$F = A(F/A, i, n)$$
$$= (\$500)(F/A, 7\%, 6)$$
$$= (\$500)(7.153)$$
$$= \$3577 \quad (\$3580)$$

The answer is (C).

ECONOMICS-14

Assuming i = annual rate of return, n = number of years, F = future worth, and P = present worth, what is the future worth of a present amount P?

(A) $P(1+i)^n$ (B) $P(1+i)^{n-1}$ (C) $P(1+i)^{-n}$ (D) $P(1+n)^i$

This situation corresponds to a single payment compound amount. Therefore,

$$F = P(1 + i)^n$$

> The answer is (A).

ECONOMICS-15

$1000 is deposited into a 9% account today. At the end of 2 yr, another $3000 will be deposited. In 5 yr, a $4000 purchase will be made. Approximately how much will be left in the account 1 yr after the purchase?

(A) $1230   (B) $1420   (C) $1540   (D) $1690

year	cash flow ($)
0	1000
1	0
2	3000
3	0
4	0
5	−4000
6	0

$F = A(F/A, i, n)$

$\quad = (\$1000)(F/P, 9\%, 6) + (\$3000)(F/P, 9\%, 4) - (\$4000)(F/P, 9\%, 1)$

$\quad = (\$1000)(1.6671) + (\$3000)(1.4116) - (\$4000)(1.0900)$

$\quad = \$1542 \quad (\$1540)$

> The answer is (C).

ECONOMICS-16

A student needs $4000/yr for 4 yr to attend college. Her father invested $5000 in a 7% account for her education when she was born. If the student withdraws $4000 at the end of her 17th, 18th, 19th, and 20th years, how much money will be left in the account at the end of her 21st year?

(A) $1700   (B) $2500   (C) $3400   (D) $4000

$$F = A(F/A, i, n)$$

$$= (\$5000)(F/P, 7\%, 21)$$

$$\times (-\$4000)(F/P, 7\%, 4) - (\$4000)(F/P, 7\%, 3)$$

$$\times (-\$4000)(F/P, 7\%, 2) - (\$4000)(F/P, 7\%, 1)$$

$$= (\$5000)(4.1406) - (\$4000)(1.3108)$$

$$\times (-\$4000)(1.2250) - (\$4000)(1.1449)$$

$$\times (-\$4000)(1.0700)$$

$$= \$1700$$

The answer is (A).

ECONOMICS-17

The following schedule of funds is available to form a sinking fund.

$t = 0$ yr	$5000
$t = 1$ yr	$4000
$t = 2$ yr	$3000
$t = 3$ yr	$2000

At the end of the fourth year, equipment costing $25,000 will have to be purchased as a replacement for old equipment. Money is valued at 20% by the company. At the time of purchase, how much money will be needed?

(A) $820   (B) $1000   (C) $2000   (D) $8200

First, find the future worth of the available funds.

$$F = P(F/P, i, n)$$

$$= (\$5000)(F/P, 20\%, 4)$$

$$+ (\$4000)(F/P, 20\%, 3) + (\$3000)(F/P, 20\%, 2)$$

$$+ (\$2000)(F/P, 20\%, 1)$$

$$= (\$5000)(2.074) + (\$4000)(1.728) + (\$3000)(1.44)$$

$$+ (\$2000)(1.20)$$

$$= \$24,000$$

The additional funds needed are

$$\text{equipment cost} - F = \$25,000 - \$24,000$$
$$= \$1000$$

> The answer is (B).

ECONOMICS-18

$10,000 is invested at the beginning of a year in a 15% security and held for 5 yr. During that time, the average annual inflation is 6%. Approximately how much, in terms of year zero dollars, will be in the account at maturity ?

(A) $11,700   (B) $13,400   (C) $15,000   (D) $15,400

First, find the future worth, F, without accounting for inflation.

$$F = P(F/P, i, n)$$
$$= (\$10,000)(F/P, 15\%, 5)$$
$$= (\$10,000)(2.0114)$$
$$= \$20,114$$

Next, figure in inflation and express F in terms of real dollars.

$$F_{\text{real}} = (\$20,114)(P/F, 6\%, 5)$$
$$= (\$20,114)(0.7473)$$
$$= \$15,030 \quad (\$15,000)$$

> The answer is (C).

ECONOMICS-19

A firm borrows $2000 for 6 yr at 8%, to be repaid in a lump sum at the end of 6 yr. At the end of 6 yr, the firm renews the loan for the amount due plus $2000 more for 2 yr at 8%. What is most nearly the amount of the loan renewal?

(A) $5280   (B) $5750   (C) $5510   (D) $6140

$$F = (\$2000)(F/P, 8\%, 6) + (\$2000)(F/P, 8\%, 2)$$

$$= (\$2000)(1.587) + (\$2000)(1.166)$$

$$= \$5506 \quad (\$5510)$$

The answer is (C).

ECONOMICS-20

A company invests $10,000 today to be repaid in 5 yr in one lump sum at 12% compounded annually. If the rate of inflation is 3% compounded annually, approximately how much profit, in present day dollars, is realized over the 5 yr?

(A) $3200   (B) $5200   (C) $5630   (D) $7620

First, find the future worth of the investment without accounting for inflation.

$$F = P(F/P, i, n)$$

$$= (\$10,000)(F/P, 12\%, 5)$$

$$= (\$10,000)(1.7623)$$

$$= \$17,623$$

Next, find the present worth accounting for inflation.

$$F_{\text{real}} = (\$17,623)(P/F, 3\%, 5)$$

$$= (\$17,623)(0.8626)$$

$$= \$15,202$$

$$\text{profit} = \$15,202 - \$10,000$$

$$= \$5202 \quad (\$5200)$$

The answer is (B).

ECONOMICS-21

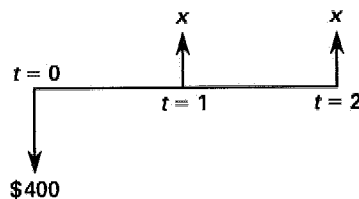What must two investments with the same present worth and unequal lives have?

(A) identical salvage values
(B) different salvage values
(C) identical equivalent uniform annual cash flows
(D) different equivalent uniform annual cash flows

Two investments with the same present worth and unequal lives must have different equivalent uniform annual cash flows.

The answer is (D).

ECONOMICS-22

The following cash-flow diagram represents an investment of $400 and a revenue of x at the end of years one and two. Given a discount rate of 15% compounded annually, what must x approximately be for this set of cash flows to have a net present worth of zero?

(A) $246   (B) $255   (C) $257   (D) $281

$$P = \$0 = A(P/A, i, n)$$
$$= -\$400 + x(P/A, 15\%, 2)$$
$$= -400 + x(1.6257)$$

Rearranging to solve for x,

$$400 = 1.6257x$$
$$x = \$246$$

The answer is (A).

ECONOMICS-23

A replacement electric motor is being considered for purchase. It is capable of providing 200 hp. The pertinent data are as follows.

cost	$3200
electrical efficiency	0.85
maintenance cost per year	$50
life expectancy	14 yr
salvage value after 14 yr	$0

The motor is used for 400 h/yr and the cost of electricity is $0.04/kW·h. (1 hp = 0.746 kW.) What is most nearly the effective annual cost using an interest rate of 10%?

(A) $2920   (B) $3250   (C) $3290   (D) $3610

The capital recovery factor for 10% and 14 yr is 0.1357.

$$A = P(A/P, i, n) + \text{annual maintenance cost}$$
$$+ \text{annual operating cost}$$

$$\text{annual cost} = (\$3200)(0.1357) + \$50$$
$$+ \frac{\left(400 \ \frac{h}{yr}\right)\left(0.04 \ \frac{\$}{kW \cdot h}\right)(200 \ hp)\left(0.746 \ \frac{kW}{hp}\right)}{0.85}$$
$$= \$3293 \quad (\$3290)$$

The answer is (C).

ECONOMICS-24

What annuity over a 10 yr period at 8% interest is most nearly equivalent to a present worth of $100?

(A) $12.50   (B) $13.80   (C) $14.10   (D) $14.90

$$A = P(A/P, i, n)$$
$$= (\$100)(A/P, 8\%, 10)$$
$$= (\$100)(0.149)$$
$$= \$14.90$$

The answer is (D).

ECONOMICS-25

Mr. Richardson borrowed $15,000 two years ago. The repayment terms of the loan are 10% interest for 10 yr and uniform annual payments. He just made his second payment. How much principal, most nearly, does he still owe?

(A) $10,100   (B) $11,700   (C) $12,000   (D) $13,000

The annual payments, A, are

$$A = P(A/P, i, n)$$
$$= (\$15,000)(A/P, 10\%, 10)$$
$$= (\$15,000)(0.1627)$$
$$= \$2441$$

year	amount owed ($)		interest owed ($)		payment ($)		balance ($)
1	15,000	+	1500	−	2441	=	$14,059
2	14,059	+	1406	−	2441	=	$13,024

Thus, Mr. Richardson still owes $13,024 ($13,000) on the principal.

The answer is (D).

ECONOMICS-26

Given that the discount rate is 15%, what is the equivalent uniform annual cash flow for the following stream of cash flows?

year 0	−$100,000
year 1	−$200,000
year 2	−$50,000
year 3	−$75,000

(A) −$158,100   (B) −$124,200   (C) −$106,250   (D) −$90,260

$$\text{EUAC} = (A/P, i, n)P$$

$$= (A/P, i, n)\left(\sum F(P/F, i, n)\right)$$

$$= (A/P, 15\%, 3)\big(-\$100{,}000 - \$200{,}000)(P/F, 15\%, 1)$$

$$-\,(\$50{,}000(P/F, 15\%, 2) - (\$75{,}000)(P/F, 15\%, 3)\big)$$

$$= 0.4380\big(-\$100{,}000 - (\$200{,}000)(0.8696)$$

$$-\,(\$50{,}000)(0.7561) - (\$75{,}000)(0.6575)\big)$$

$$= (0.4380)(-\$361{,}000)$$

$$= -\$158{,}100$$

> The answer is (A).

ECONOMICS–27

A company must relocate one of its factories in 3 yr. Equipment for the loading dock is being considered for purchase. The original cost is \$20,000, and the salvage value after 3 yr is \$8000. The company's rate of return on money invested is 10%. The capital recovery rate per year is most nearly

(A) \$4810/yr   (B) \$4950/yr   (C) \$5120/yr   (D) \$5630/yr

$$\text{CR} = P(A/P, i, n) - F(A/F, i, n)$$

$$= (\$20{,}000)(A/P, 10\%, 3) - (\$8000)(A/F, 10\%, 3)$$

$$= (\$20{,}000)(0.4021) - (\$8000)(0.3021)$$

$$= \$5625/\text{yr}$$

> The answer is (D).

ECONOMICS–28

In 5 yr, \$18,000 will be needed to pay for a building renovation. In order to generate this sum, a sinking fund consisting of three annual payments is established now. No further payments will be made after the third year. What payments are most nearly necessary if money is worth 15% per year?

(A) \$2670   (B) \$2870   (C) \$3920   (D) \$5100

The present worth of \$18,000 at the end of the third year is

$$P_3 = F_5(P/F, i, n)$$
$$= (\$18{,}000)(P/F, 15\%, 2)$$
$$= (\$18{,}000)(0.7561)$$
$$= \$13{,}610$$

The sinking fund must generate \$13,610 in 3 yr. The payments that are necessary are

$$A = P(A/P, i, n)$$
$$= (\$13{,}610)(A/F, 15\%, 3)$$
$$= (\$13{,}610)(0.2880)$$
$$= \$3920$$

The answer is (C).

ECONOMICS-29

Mr. Johnson borrows \$100,000 at 10% effective annual interest. He must pay back the loan over 30 yr with uniform monthly payments due on the first day of each month. Approximately what amount does Mr. Johnson pay each month?

(A) \$840   (B) \$850   (C) \$870   (D) \$880

An effective annual interest rate of 10% is equivalent to an effective monthly rate of

$$(1 + i)^{12} - 1 = 0.1$$
$$i = (1.1)^{1/12} - 1 = 0.007974 \quad (0.7974\%/\text{mo})$$

The number of months that Mr. Johnson has to pay off his loan is

$$n = (30 \text{ yr}) \left(12 \, \frac{\text{mo}}{\text{yr}} \right)$$
$$= 360 \text{ mo}$$

$$\text{end of month payment} = P(A/P, i, n)$$
$$= (\$100{,}000)(A/P, 0.7974\%, 360)$$
$$= (\$100{,}000) \left(\frac{(0.007974)(1 + 0.007974)^{360}}{(1 + 0.007974)^{360} - 1} \right)$$
$$= \$846$$

beginning of month payment $= F(P/F, i, n) = (\$846)(P/F, 0.7974\%, 1)$

$$= (\$846)(1 + 0.007974)^{-1}$$
$$= \$839 \quad (\$840)$$

The answer is (A).

ECONOMICS-30

What is the formula for a straight-line depreciation rate?

(A) $\dfrac{100\% - \% \text{ net salvage value}}{\text{estimated service life}}$

(B) $\dfrac{\% \text{ net salvage value}}{\text{estimated service life}}$

(C) $\dfrac{100\% \text{ net salvage value}}{\text{estimated service life}}$

(D) $\dfrac{\text{average net salvage value}}{\text{estimated service life}}$

$$\text{straight-line depreciation rate} = \frac{100\% - \% \text{ net salvage value}}{\text{estimated service life}}$$

The answer is (A).

ECONOMICS-31

What is the book value of equipment purchased 3 yr ago for $15,000 if it is depreciated using the sum of years' digits (SOYD) method? The expected life is 5 yr.

(A) $3000   (B) $4000   (C) $6000   (D) $9000

In the SOYD method, the digits corresponding to n, the number of years of estimated life, are added. The total sum of years' digits, t, is

$$t = \frac{n(n+1)}{2}$$
$$= \frac{(5 \text{ yr})(5 \text{ yr} + 1)}{2}$$
$$= 15 \text{ yr}$$

The depreciation charge for the first year is

$$D_1 = \left(\frac{n}{t}\right) P$$
$$= \left(\frac{5 \text{ yr}}{15 \text{ yr}}\right) (\$15,000)$$
$$= \$5000$$

The depreciation charge for year two is

$$D_2 = \left(\frac{n-1}{t}\right) P$$
$$= \left(\frac{4 \text{ yr}}{15 \text{ yr}}\right) (\$15,000)$$
$$= \$4000$$

For year 3, the depreciation charge is

$$D_3 = \left(\frac{n-2}{t}\right) P$$
$$= \left(\frac{3 \text{ yr}}{15 \text{ yr}}\right) (\$15,000)$$
$$= \$3000$$

The total depreciation is

$$D_{\text{total}} = D_1 + D_2 + D_3$$
$$= \$5000 + \$4000 + \$3000$$
$$= \$12,000$$

The book value is

$$\text{BV} = P - D_{\text{total}}$$
$$= \$15,000 - \$12,000$$
$$= \$3000$$

The answer is (A).

ECONOMICS-32

The purchase of a motor for $6000 and a generator for $4000 will allow a company to produce its own energy. The configuration can be assembled for $500. The service will operate for 1600 h/yr for 10 yr. The maintenance cost is $300/yr, and the cost to operate is $0.85/h for fuel and related costs. There is $400 in salvage value for the system at the end of 10 yr. Using straight-line depreciation, what is the annual cost for the operation?

(A) $2480/yr   (B) $2630/yr   (C) $2670/yr   (D) $2710/yr

$$\text{total initial cost} = \$6000 + \$4000 + \$500$$

$$= \$10,500$$

$$\text{straight-line depreciation} = \frac{\text{total initial cost} - \text{salvage value}}{t}$$

$$= \frac{\$10,500 - \$400}{10 \text{ yr}}$$

$$= \$1010/\text{yr}$$

$$\text{operation cost} = \left(0.85 \ \frac{\$}{h}\right)\left(1600 \ \frac{h}{yr}\right)$$

$$= \$1360/\text{yr}$$

$$\text{annual cost} = \text{straight-line depreciation} + \text{maintenance cost}$$

$$+ \text{operation cost}$$

$$= \$1010 + \$300 + \$1360$$

$$= \$2670/\text{yr}$$

The answer is (C).

ECONOMICS-33

Company A purchases $200,000 of equipment in year 0. It decides to use straight-line depreciation over the expected 20 yr life of the equipment. The interest rate is 14%. If its overall tax rate is 40%, what is the present worth of the after-tax depreciation recovery?

(A) $23,500   (B) $24,000   (C) $26,500   (D) $39,700

$$\text{straight-line depreciation} = \frac{\text{equipment cost}}{\text{equipment life expectancy}}$$

$$= \frac{\$200,000}{20 \text{ yr}}$$

$$= \$10,000/\text{yr write off}$$

$$P = A(P/A, i, n)(\text{tax rate})$$

$$= (\$10,000)(P/A, 14\%, 20)(\text{tax rate})$$

$$= (\$10,000)(6.623)(0.40)$$

$$= \$26,500$$

The answer is (C).

ECONOMICS-34

Which of the following is true regarding the minimum attractive rate of return used in judging proposed investments?

(A) It is the same for every organization.

(B) It is larger than the interest rate used to discount expected cash flow from investments.

(C) It is frequently a policy decision made by an organization's management.

(D) It is not relevant in engineering economy studies.

The answer is (C).

ECONOMICS-35

What is most nearly the effective annual interest rate on a loan if the nominal interest rate is 12%/yr compounded quarterly?

(A) 11.8%   (B) 12.0%   (C) 12.3%   (D) 12.6%

The effective interest rate, i, is

$$i = \left(1 + \frac{r}{m}\right)^m - 1$$

$$= \left(1 + \frac{0.12}{4}\right)^4 - 1$$

$$= 0.1255 \quad (12.55\%)$$

In the preceding equation, r is the nominal interest rate and m is the number of times the nominal interest rate is compounded per year.

The answer is (D).

ECONOMICS-36

A person pays interest on a loan semiannually at a nominal annual interest rate of 16%. What is most nearly the effective annual interest rate?

(A) 15.5%   (B) 15.7%   (C) 16.4%   (D) 16.6%

The effective interest rate, i, is

$$i = \left(1 + \frac{r}{m}\right)^m - 1$$
$$= \left(1 + \frac{0.16}{2}\right)^2 - 1$$
$$= 0.1664 \quad (16.64\%)$$

In the preceding equation, r is the nominal interest rate and m is the number of times the nominal interest rate is compounded per year.

The answer is (D).

ECONOMICS-37

Which of the following statements is NOT correct?

(A) A nominal rate of 12% per annum compounded quarterly is the same as 12%/4 = 3%/quarter.
(B) $1 compounded quarterly at 3% for n yr has a future value of $(1.03)^{4n}$.
(C) Compounding quarterly at a nominal rate of 12%/yr is equivalent to compounding annually at a rate of 12.55%.
(D) Effective rate of return in options (A), (B), and (C) is the difference between 12.55% and 12%.

The statements given in options (A), (B), and (C) are correct. Only option (D) is false.

The answer is (D).

ECONOMICS-38

A bank is advertising 9.5% accounts that yield 9.84% annually. How often is the interest compounded?

(A) daily (B) monthly (C) bimonthly (D) quarterly

The formula for effective interest rate, i, is

$$i = \left(1 + \frac{r}{m}\right)^m - 1$$

Substituting for i,

$$0.0984 = \left(1 + \frac{0.095}{m}\right)^m - 1$$

In the preceding equation, r is the nominal interest rate and m is the number of times interest is compounded per year.

Solve for m algebraically, or by trial and error using the five choices. The solution is $m = 4$.

The answer is (D).

ECONOMICS-39

A firm is considering renting a trailer at \$300/mo. The unit is needed for 5 yr. The leasing company offers a lump sum payment of \$24,000 at the end of 5 yr as an alternative payment plan, but is willing to discount this figure. The firm places a value of 10% (effective annual rate) on invested capital. How large should the discount be in order to be acceptable as an equivalent?

(A) \$750 (B) \$820 (C) \$980 (D) \$1030

For a 10% effective rate per year, the effective monthly rate, i, is

$$0.1 = (1 + i)^{12} - 1$$
$$i = 0.007974/\text{mo}$$

At \$300/mo for 5 yr,

$$\begin{aligned} F &= A(F/A, i, n) \\ &= (\$300)(F/A, 0.7974\%, 60) \\ &= (\$300)(76.561) \\ &= \$22,970 \end{aligned}$$

$$\text{discount} = \$24,000 - F$$
$$= \$24,000 - \$22,970$$
$$= \$1030$$

The answer is (D).

ECONOMICS-40

Consider a deposit of \$1000, to be paid back in 1 yr by \$975. What are the conditions on the rate of interest, i, in %/yr compounded annually, such that the net present worth of the investment is positive? Assume $i \geq 0\%$.

(A) $0\% \leq i < 50\%$
(B) $0\% \leq i < 90\%$
(C) $12.5\% \leq i < 100\%$
(D) There are no conditions on i that will make this possible.

$$\text{Set}: P = 0 = F(P/F, i, n)$$
$$= -\$1000 + (\$975)(P/F, i, 1)$$
$$= -\$1000 + (\$975)\left(\frac{1}{1+i}\right)$$
$$i = -0.0256$$

Therefore, there is no solution such that $i \geq 0\%$, and $P \geq 0$.

The answer is (D).

ECONOMICS-41

Consider a deposit of \$600, to be paid back in 1 yr by \$700. What are the conditions on the rate of interest, i, in %/yr compounded annually, such that the net present worth of the investment is positive? Assume $i \geq 0\%$.

(A) $12.5\% \leq i < 14.3\%$
(B) $0\% \leq i < 14.3\%$
(C) $0\% \leq i < 16.7\%$
(D) $16.7\% \leq i \leq 100\%$

$$\text{Set}: P > 0 > F(P/F, i, n)$$
$$> (-\$600 + \$700)(P/F, i, 1)$$
$$> (-\$600 + \$700)\left(\frac{1}{1+i}\right)$$
$$\frac{7}{6} > 1 + i$$
$$i < 0.167 \quad (16.7\%)$$

Thus, for P > \$0, 0% $\leq i <$ 16.7%.

The answer is (C).

ECONOMICS–42

A company has \$100,000 to spend on the various projects listed. Using these projects only, what should this company consider its minimum attractive rate of return to be?

project	investment required (\$)	expected return (%)
A	10,000	14
B	25,000	10
C	50,000	12
D	40,000	16
E	25,000	11
F	30,000	10
G	20,000	12

(A) 10%　　　　(B) 11%　　　　(C) 12%　　　　(D) 14%

The highest-return projects should be chosen until all of the company's money is spent.

project	investment (\$)	return (%)	cumulative investment (\$)
D	40,000	16	40,000
A	10,000	14	50,000
C	50,000	12	100,000

The minimum attractive rate of return is 12%, the return on project C.

The answer is (C).

ECONOMICS-43

What is most nearly the internal rate of return on the following cash flow?

$t = 0$ yr   spend \$100,000
$t = 1$ yr   spend \$50,000
$t = 2$ yr   receive \$100,000
$t = 3$ yr   receive \$103,000

(A) 15.0%   (B) 17.5%   (C) 18.2%   (D) 20.0%

The IRR is the interest rate which makes the present worth of the cash flow zero. It must be found by trial and error using the answer choices provided.

$$\text{IRR} = 0 = F(P/F, i, n) = (-\$100{,}000 - \$50{,}000)(P/F, i, 1)$$
$$+ (\$100{,}000)(P/F, i, 2) + (\$103{,}000)(P/F, i, 3)$$

For an interest rate of 15%, the equation for the present worth of the cash flow is

$$P = -\$100{,}000 - (\$50{,}000)(0.8696)$$
$$+ (\$100{,}000)(0.7561) + (\$103{,}000)(0.6575)$$
$$= -\$100{,}000 - \$43{,}480 + \$75{,}610 + \$67{,}772$$
$$= -\$98 \quad (\approx 0)$$

The IRR is approximately 15%.

The answer is (A).

ECONOMICS-44

Which of the following situations has a conventional cash flow so that an internal rate of return can be safely calculated and used?
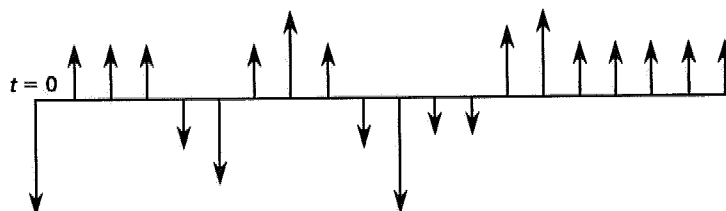
(A) You purchase a house and pay the bank in monthly installments.

(B) You lease a car and pay by the month.

(C) Your company undertakes a mining project in which the land must be reclaimed at the end of the project.

(D) You invest in a safe dividend stock and receive dividends each year.

The situation in option (D) has a negative cash flow, one sign change, then a positive cash flow. Thus, it is the only situation that has a conventional cash flow so that an IRR can be safely calculated and used.

The answer is (D).

ECONOMICS-45

A project has the cash flow shown. Theoretically, how many internal rates of return can be calculated for it?

(A) 2   (B) 3   (C) 4   (D) 5

There are five places in the cash flow where there are sign changes. Thus, theoretically, five internal rates of return could be calculated for it.

The answer is (D).

ECONOMICS-46

An investment of $350,000 is made, to be followed by revenue of $200,000 each year for three years. What is most nearly the annual rate of return on investment for this project?

(A) 15%   (B) 33%   (C) 42%   (D) 57%

The formula for annual payment, A, is

$$A = P(A/P, i, n)$$
$$\$200{,}000 = \$350{,}000(A/P, i, 3)$$
$$(A/P, i, 3) = \frac{\$200{,}000}{\$350{,}000}$$
$$= 0.57143$$

Interpolating from the tables,

i (%)	$(A/P, i, 3)$
30	0.55063
32.66	0.57143
35	0.58966

Thus, the IRR is approximately 33%.

The answer is (B).

ECONOMICS-47

A steel drum manufacturer incurs a yearly fixed operating cost of $200,000. Each drum manufactured costs $160 to produce and sells for $200. What is the manufacturer's break-even sales volume in drums per year?

(A) 1000   (B) 1250   (C) 2500   (D) 5000

Given that x is the number of drums sold per year, the cash flow per year is

operating cost	$-\$200,000$
manufacturing cost	$-\$160x$
sales	$\$200x$

In order to break even, total cash flow must be zero.

$$\text{operating cost} + \text{manufacturing cost} + \text{sales} = 0$$
$$-\$200,000 - \$160x + \$200x = 0$$
$$\$40x = \$200,000$$
$$x = 5000$$

The answer is (D).

ECONOMICS-48

XYZ Corporation manufactures bookcases that it sells for $65 each. It costs XYZ
$35,000/yr to operate its plant. This sum includes rent, depreciation charges on
equipment, and salary payments. If the cost to produce one bookcase is $50,
how many bookcases must be sold each year for XYZ to avoid taking a loss?

(A) 539 bookcases/yr   (B) 750 bookcases/yr

        (C) 2333 bookcases/yr   (D) 2334 bookcases/yr

Determine the quantity of bookcases sold, Q.

$$Q = \frac{f}{p - a}$$

$$= \frac{\dfrac{\$35{,}000}{\text{yr}}}{\dfrac{\$65}{\text{bookcase}} - \dfrac{\$50}{\text{bookcase}}}$$

$$= 2333.3 \text{ bookcases/yr}$$

In the preceding equation, f is the fixed cost, p is the fixed revenue,
and a is the incremental cost.

Therefore, XYZ must sell 2334 bookcases/yr to avoid taking a loss.

> The answer is (D).

ECONOMICS-49

A manufacturing firm maintains one assembly line to produce signal generators.
Weekly demand for the generators is 35 units, and the line operates for 7 h/d,
5 d/wk. What is the maximum production time per unit required of the line in
order to meet demand?

(A) 0.750 h/unit   (B) 1.00 h/unit   (C) 2.25 h/unit   (D) 5.00 h/unit

The maximum production time per unit, t, can be derived from

weekly demand = t(operating hours per day)(operating days per week)

$$\frac{1 \text{ wk}}{35 \text{ units}} = t \left(\frac{1 \text{ d}}{7 \text{ h}}\right) \left(\frac{1 \text{ wk}}{5 \text{ d}}\right)$$

Rearranging to solve for t,

$$t = \left(\frac{1\text{ d}}{7\text{ h}}\right)\left(\frac{1\text{ wk}}{5\text{ d}}\right)\left(35\ \frac{\text{units}}{\text{wk}}\right)$$
$$= 1.00\text{ h/unit}$$

The answer is (B).

ECONOMICS-50

In determining the cost involved in fabricating subassembly B within XYZ Corporation, the following data have been gathered.

XYZ's costs of manufacturing subassembly B

item	cost
direct material	$0.30/unit
direct labor	$0.50/unit
tooling setup	$300/setup

It is decided to subcontract the manufacturing of subassembly B to an outside company. For an order of 100 units, which one of the following unit price bids from outside companies is unacceptable to XYZ Corporation?

(A) $3.50/unit   (B) $3.65/unit   (C) $3.75/unit   (D) $4.10/unit

For 100 units,

$$\text{cost per unit} = \frac{\text{total setup cost}}{\text{no. of units}} + \text{direct material cost} + \text{direct labor cost}$$
$$= \frac{\frac{\$300}{\text{setup}}}{100\text{ units}} + \frac{\$0.30}{\text{unit}} + \frac{\$0.50}{\text{unit}}$$
$$= \$3.80/\text{unit}$$

Thus, a bid of $4.10 is unacceptable.

The answer is (D).

ECONOMICS-51

The economic order quantity (EOQ) is defined as the order quantity that minimizes the inventory cost per unit time. Which of the following is NOT an assumption of the basic EOQ model with no shortages?

(A) The demand rate is uniform and constant.
(B) There is a positive cost on each unit inventoried.
(C) The entire reorder quantity is delivered instantaneously.
(D) There is an upper bound on the quantity ordered.

$$EOQ = \sqrt{\frac{2aK}{h}}$$

In the preceding equation, a is the constant depletion rate (items per unit time), K is the fixed cost per order in dollars, and h is the inventory storage cost (dollars per item per unit time).

Thus, there is no upper bound on the quantity ordered.

The answer is (D).

ECONOMICS-52

Which of the following events will cause the optimal lot size, given by the classic EOQ model with no shortages, to increase?

(A) a decrease in inventory carrying cost
(B) a decrease in demand
(C) an increase in demand
(D) either option (A) or (C)

$$EOQ = \sqrt{\frac{2aK}{h}}$$

In the preceding equation, a is the constant depletion rate (items per unit time), K is the fixed cost per order in dollars, and h is the inventory storage cost (dollars per item per unit time).

Thus, a decrease in inventory carrying cost, h, or an increase in demand, a, will cause the optimal lot size to increase.

The answer is (D).

ECONOMICS-53

A manufacturer of sports equipment produces tennis rackets for which there is a demand of 200/mo. The production setup cost for each batch of rackets is $300. In addition, the inventory carrying cost for each racket is $24/yr. Using the EOQ model, which is most nearly the best production batch size for the rackets?
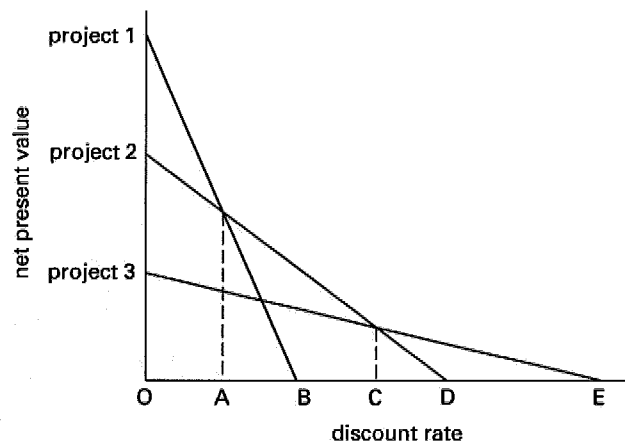
(A) 120 units   (B) 170 units   (C) 250 units   (D) 350 units

$$EOQ = \sqrt{\frac{2aK}{h}}$$

$$= \sqrt{\frac{(2)\left(200 \ \frac{\text{rackets}}{\text{mo}}\right)(\$300)}{\left(\frac{\$24}{\text{yr}}\right)\left(\frac{1 \ \text{yr}}{12 \ \text{mo}}\right)}}$$

$$= 244.9 \ \text{units} \quad (250 \ \text{units})$$

The answer is (C).

ECONOMICS-54

For what range of discount rates is project 2 the most attractive project?

(A) OA   (B) OD   (C) AC   (D) AD

Project 2 has the highest net present worth over the range AC.

The answer is (C).

ECONOMICS-55

The internal rate of return of a project that involves an initial investment with subsequent positive cash flows is 18%. Five companies are considering the project. Given the following respective minimum attractive rates of return (MARR), which company will be most likely to accept the project?

company	MARR (%)
A	12
B	15
C	18
D	19

(A) company A   (B) company B   (C) company C   (D) company D

The project is good for companies A, B, and C. However, it is the best for company A.

> The answer is (A).

ECONOMICS-56

Two mutually exclusive projects are being considered. Project A requires an investment of $1,000,000 at year zero. Project A will pay $200,000/yr forever. Project B also requires an investment of $1,000,000 at year zero. However, it pays $1,500,000 the next year, and nothing after that. The internal rate of return (IRR) on project A is 20%. The IRR for project B is 50%. Which is the better project? The borrowing rate is 5%.

(A) Project A, because it has a lower IRR.
(B) Project B, because it has a higher IRR.
(C) The two projects are equivalent.
(D) Project A, because its net present worth is higher.

The use of IRR breaks down for mutually exclusive projects. Therefore, consider the net present worth, P, of each project. The net present worth of project A is

$$P_A = A(P/A, i, n)$$
$$= -\$1,000,000 + (\$200,000)(P/A, 5\%, n \text{ approaches } \infty)$$
$$= -\$1,000,000 + (\$200,000) \lim_{n \to \infty} \left(\frac{1.05^n - 1}{(0.05)(1.05)^n} \right)$$
$$= -\$1,000,000 + (\$200,000)(20)$$
$$= \$3,000,000$$

The net present worth of project B is

$$P_B = -\$1{,}000{,}000 + (\$1{,}500{,}000)(P/F, 5\%, 1)$$
$$= -\$1{,}000{,}000 + (\$1{,}500{,}000)(0.9524)$$
$$= \$428{,}600$$

Since the net present worth of project A is higher, the company should choose project A.

> The answer is (D).

ECONOMICS-57

Which plan is the least expensive way to purchase plant maintenance equipment? The discount rate is 11%.

plan A:	$50,000 down, equal payments of $25,115.12 for 20 yr
plan B:	nothing down, equal payments of $31,393.91 for 20 yr
plan C:	$100,00 down, equal payments of $21,975.74 for 20 yr

(A) plan A   (B) plan B   (C) plan C   (D) plan A or B

plan A
$$P = A(P/A, i, n) = \$50{,}000 + (\$25{,}115.12)(P/A, 11\%, 20)$$
$$= \$250{,}000$$

plan B
$$P = (\$31{,}393.91)(P/A, 11\%, 20)$$
$$= \$250{,}000$$

plan C
$$P = \$100{,}000 + (\$21{,}975.74)(P/A, 11\%, 20)$$
$$= \$275{,}000$$

Thus, plan C is the most expensive and plans A and B are equivalent.

> The answer is (D).

ECONOMICS-58

The volatility, β, of a stock is found to be 1.5 times the stock market average. If the risk premium for buying stocks averages 8.3% and the present treasury bill rate (assumed to be risk free) is 7%, what is most nearly the expected return (ER) on the stock?

(A) 12.5%   (B) 15.3%   (C) 18.9%   (D) 19.5%

$$ER = \text{risk-free rate} + \beta(\text{market premium})$$
$$= 7\% + (1.5)(8.3\%)$$
$$= 19.45\% \quad (19.5\%)$$

The answer is (D).

ECONOMICS-59

What is a borrower of a particular loan almost always required to do during repayment?

(A) pay exactly the same amount of interest each payment
(B) repay the loan over an agreed-upon amount of time
(C) pay exactly the same amount of principal each payment
(D) both options (A) and (C)

The answer is (B).

ECONOMICS-60

What is "work in process" classified as?

(A) an asset   (B) a liability   (C) an expense   (D) a revenue

Work in process is included in the working fund investments. The working fund investments is an asset not subject to depreciation.

The answer is (A).

ECONOMICS-61

What is the indirect product cost (IPC) spending variance?
(A) the difference between actual IPC and IPC absorbed
(B) the difference between actual IPC and IPC volume-adjusted budget
(C) the IPC volume-adjusted budget (fixed + (volume)(variable IPC rate))
(D) the IPC volume-adjusted budget minus the total IPC absorbed

The IPC spending variance is the difference between actual IPC and IPC volume-adjusted budget.

The answer is (B).

ECONOMICS-62

Firm A uses full absorption costing while firm B uses variable product costing. How will the financial statements of these companies differ?
(A) Firm A has a higher cost of goods sold and, therefore, a smaller profit.
(B) Firm A has a higher cost of goods sold, higher inventory value, and higher retained earnings.
(C) Firm A has a smaller cost of goods sold and a larger profit.
(D) Firm A has a smaller cost of goods sold, no change in inventory value, and no change in retained earnings.

Full absorption costing includes all direct and indirect, fixed and variable production costs. Variable product costing leaves fixed costs for the expense accounts. Therefore, the cost of goods sold is less under variable costing. Inventory value (an asset) is higher under full absorption. Since assets equal liabilities plus owner's equity, the owner's equity (retained earnings) must increase as the assets have.

The answer is (B).

ECONOMICS-63

How is the material purchase price variance defined?

(A) (quantity purchased)(actual price)
 − (quantity purchased)(standard price)

(B) (quantity issued − standard quantity)(standard price)

(C) (actual price − standard price)(quantity used)

(D) (quantity purchased − quantity used)(actual price)

The definition of material purchase price variance is given in option (A).

Note: Option (B) is the material usage variance.

The answer is (A).

ECONOMICS-64

Which of the following does NOT affect owner's equity?

(A) dividends paid
(B) license to start operation
(C) invested capital
(D) expense to get license to start operation

The license to start business is a company asset, not a part of owner's equity.

The answer is (B).

ECONOMICS-65

Higrow Company is planning to grow 30% during the next fiscal year. What has to increase if Higrow is to achieve their goal?

(A) the ratio of sales to total assets
(B) the ratio of total assets to equity
(C) equity
(D) any combination of (A), (B), and (C)

$$\text{sales} = \left(\frac{\text{sales}}{\text{total assets}}\right)\left(\frac{\text{total assets}}{\text{equity}}\right)(\text{equity})$$

Sales can grow only if at least one of the three terms on the right hand side of the equation grows.

The answer is (D).

ECONOMICS-66

Tops Corporation's gross margin is 45% of sales. Operating expenses such as sales and administration are 15% of sales. Tops is in a 40% tax bracket. What percent of sales is their profit after taxes?

(A) 0.0%   (B) 5.0%   (C) 18%   (D) 24%

$$\text{before tax profit} = \text{gross margin} - \text{sales and administrative costs}$$
$$= 45\% - 15\%$$
$$= 30\%$$
$$\text{after tax profit} = (1 - \text{tax bracket})(\text{before tax profit})$$
$$= (1 - 0.40)(30\%)$$
$$= 18\%$$

The answer is (C).

ECONOMICS-67

Z Corporation is applying for a short-term loan. In reviewing Z Corporation's financial records, the banker finds a current ratio of 2.0, an acid test ratio of 0.5, and an accounts receivable period of 70 d. What should the banker do?

(A) be concerned that Z Corporation will be unable to meet the payments
(B) suggest that Z Corporation lower its inventories
(C) suggest that Z Corporation be more aggressive in collecting on its invoices
(D) both options (B) and (C)

Z Corporation has invested heavily in inventory and accounts receivable. If it could change its accounts receivable collection period to between 30 and 60 days and invest less in inventory, the company would probably not need the loan.

The answer is (D).

ECONOMICS-68

Companies A and B are identical except for their inventory accounting systems. Company A uses the last-in, first-out convention while company B uses the first-in, first-out convention. How will their financial statements differ in an inflationary environment?

(A) Company A's profits will be higher and the book value of their inventory will be higher than for company B.

(B) Company A's profits will be higher and the book value of their inventory will be lower than for company B.

(C) Company B's profits and inventory book value will be higher than for company A.

(D) Company B's profits will be higher than A's, but inventory book value will be lower.

Last-in, first-out (LIFO) puts a higher value on the inventory that went into the cost of goods sold. Thus, the gross margin is lowered and profits are lowered. The remaining inventory is still valued at old prices, so its value is also low.

The answer is (C).

ECONOMICS-69

What is the acid test ratio?

(A) the ratio of owner's equity to total current liabilities
(B) the ratio of all assets to total liabilities
(C) the ratio of current assets (exclusive of inventory) to total current liabilities
(D) the ratio of gross margin to operating, sales, and administrative expenses

The answer is (C).

ECONOMICS-70

The balance sheet of Allied Company is as follows.

assets		liabilities	
cash	$10,000	payables	$17,000
receivables	$12,000	notes due	$6,000
inventory	$7,000	long term debt	$3,000
capital equipment	$20,000	owner's equity	$23,000
total	$49,000	total	$49,000

What is most nearly its acid test ratio?

(A) 0.39   (B) 0.59   (C) 0.85   (D) 1.1

$$\text{acid test ratio} = \frac{\text{cash} + \text{accounts receivable}}{\text{total liabilities}}$$

$$= \frac{\$10,000 + \$12,000}{\$17,000 + \$6000 + \$3000}$$

$$= 0.846 \quad (0.85)$$

The answer is (C).