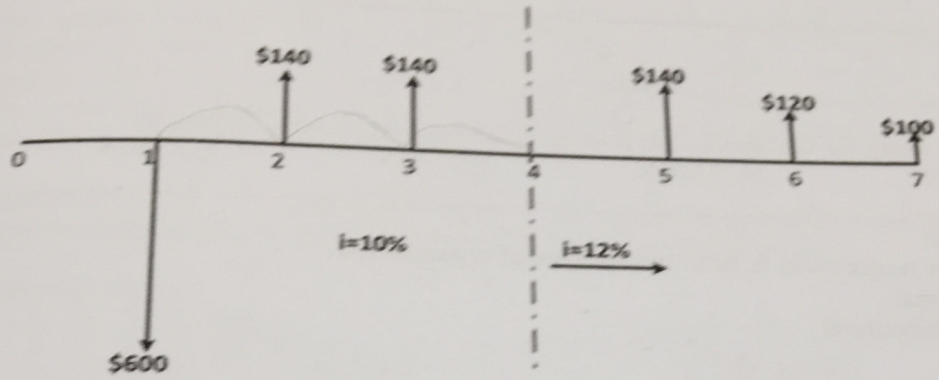
Concordia University
Faculty of Engineering and Computer Science

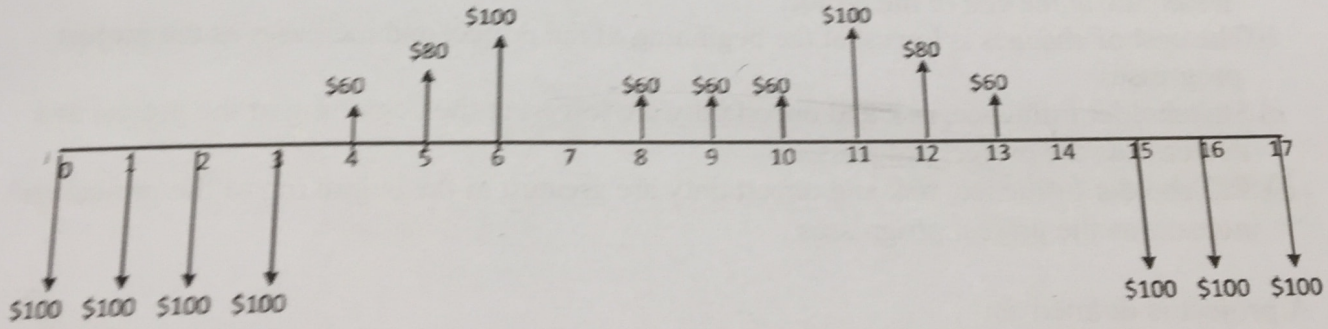
Question (1):



(1) The net present worth for the above cash flow, with an interest rate of 10% for years 1 to4, and 12% thereafter, is close to:

a) $191 b) –$125 c) –$132 d) $137

Questions (2-3):
Using the interest rate 12%, please answer the following questions:



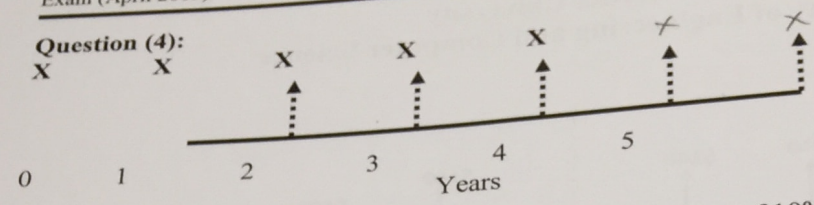
(2) Net present worth for the above cash flow is close to:

a) –$126 b) $721 c) –$112 d) –$45

(3) Future worth for the above cash flow is close to:

a) –$568 b) –$309 c) $677 d) –$871

Question (4):



(4) Present worth for the above cash flow at an interest rate of 10% is close to:
a) 5.217**X** b) 3.605**X** c) 2.893**X** d) 3.791**X**

Questions (5-9):

(5) A complex project will fit best in what type of organization:
a) Functional
b) Cross-functional
c) Matrix
d) Balanced

(6) When planning a project schedule, the duration estimation of each activity can NOT be from:
a) Past experience
b) Expert opinion
c) Mathematical calculation based on pessimistic, optimistic and most likely duration
d) Critical path

(7) Which statement with respect to the project life cycle is FALSE:
a) Project cost and staffing level begin slowly at the beginning of the project and decrease at a faster rate at the end of the project
b) The cost of changes is lowest at the beginning of the project and increases as the project progresses
c) Stakeholder influence, risk and uncertainty are lowest at the beginning of the project and decrease as the project progresses
d) Stakeholder influence, risk and uncertainty are greatest at the beginning of the project and increase as the project progresses

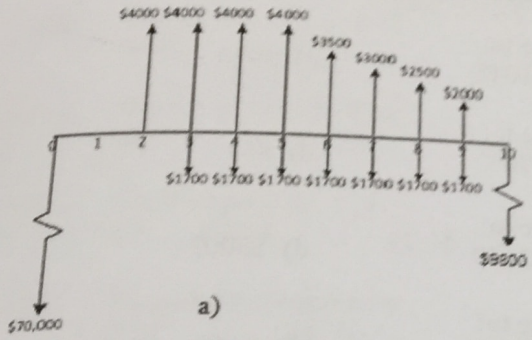
(8) A project is defined as:
a) An endeavor, that is planned and operated by people and constrained by limited resources
b) A process of considerable scope that implements a plan
c) An objective based effort of temporary nature
d) A temporary endeavor undertaken to create a unique product or service

(9) What should be done by the project manager to ensure that all work in the project is included:
a) Create a WBS
b) Create a cost estimation
c) Create a scope statement
d) Create a communication plan

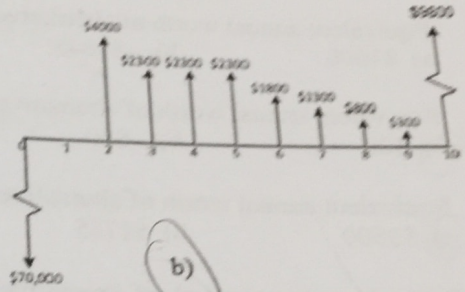
Question (10):

Sirius Engineering Company intends to purchase an alternative energy generating system to reduce its energy costs. It has estimated that the purchase price of the alternative energy system will be $70,000 and will have a useful life of 10 years, after which it will be sold for $10,000. The company expects to begin to realize savings in its energy costs two years after acquiring the system. In this regard, it expects that initial savings will be $4000 per year for four years, which then will decrease by $500 a year until the useful life of the energy system has been reached. The company expects to perform annual maintenance on the alternative energy system at a cost of $1700 commencing on the 3rd year and ending on the 10th year.

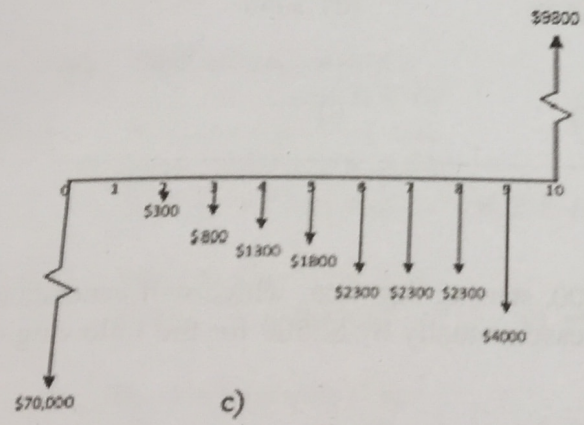
Which one of the following cash flow diagrams represents the company's cash transactions with respect to the alternative energy generating system over the next 10 years?



a)



b)



c)

d) cash flows a), b) and c) are all wrong

Question (11):

A company has expanded its business to include the assembly of sewing machines. The 3rd sewing machine took 75 hours to be assembled and the 12th sewing machine took 59 hours. Based on the learning curve equation and a labour cost of $95/hour, the estimated cost of the 20th sewing machine is close to:

(11) a) $7232 b) $3243 c) $4258 d) $5136

Questions (12-16):

Consider the following investment alternatives and 12% interest rate:

	Alternatives Cash Flow ($)			
n	**A**	**B**	**C**	**D**
0	–$3000	–$2000	–$9000	–$4000
1	–$2000	$400	$2000	$3000
2	$4000	$500	$4000	$2000
3	$2000	$600	$8000	$1000
4	$4000	$700	$8000	$500
5	$2000	$800	$4000	$500
	971.84	22.66	2502.869	440.05

(12) Equivalent annual worth of alternative (A) is close to:
a) $1000 b) –$1045 c) $1045 d) $970

(13) Equivalent annual worth of alternative (B) is close to:
a) $20 b) –$20 c) $70 d) $53

(14) Equivalent annual worth of alternative (C) is close to:
a) $2500 b) $1755 c) $2659 d) $3002

(15) Equivalent annual worth of alternative (D) is close to:
a) $470 b) $411 c) $507 d) $440

(16) The best alternative is:
a) A b) B c) C d) D

Questions (17-18):

An investor can make 3 end of year payments of $15,000, starting this year, which will generate a receipt of $10,000 at the end of year 4, which will increase annually by $2500 for the following 4 years. The investment will earn a return of 10%.

(17) The uniform annual worth of the investment is close to:
a) $1395 b)$22,485 c) $2940 d)$760

(18) At year 5, the entire investmentis close to:
a) $15,412 b)$6550 c) $12,503 d)$815

Question (19):
Over a period of 10 years, an investor deposits $1500 at the end of each year in a savings account that pays 8% interest, compounded quarterly.

(19) The amount available in his account immediately before the 10^{th} deposit is close to:
a) $19,500 b) $20,000 c) $20,500 d) $21,000

Questions (20-26): See the network on the following page.

Using the Critical Path Method, calculate early start (ES), late start (LS), early finish (EF), late finish (LF) and(total) float (F) for each activity in the network on the following page and answer the following questions? Note: D in the legend indicates activity duration.

(20) The ES of activity H is:
a) 22 b) 17 c) 4 d) 1

(21) The LF of activity B is:
a) 17 b) 18 c) 21 d) 19

(22) The F of activity A is:
a) 5 b) 13 c) 18 d) 17

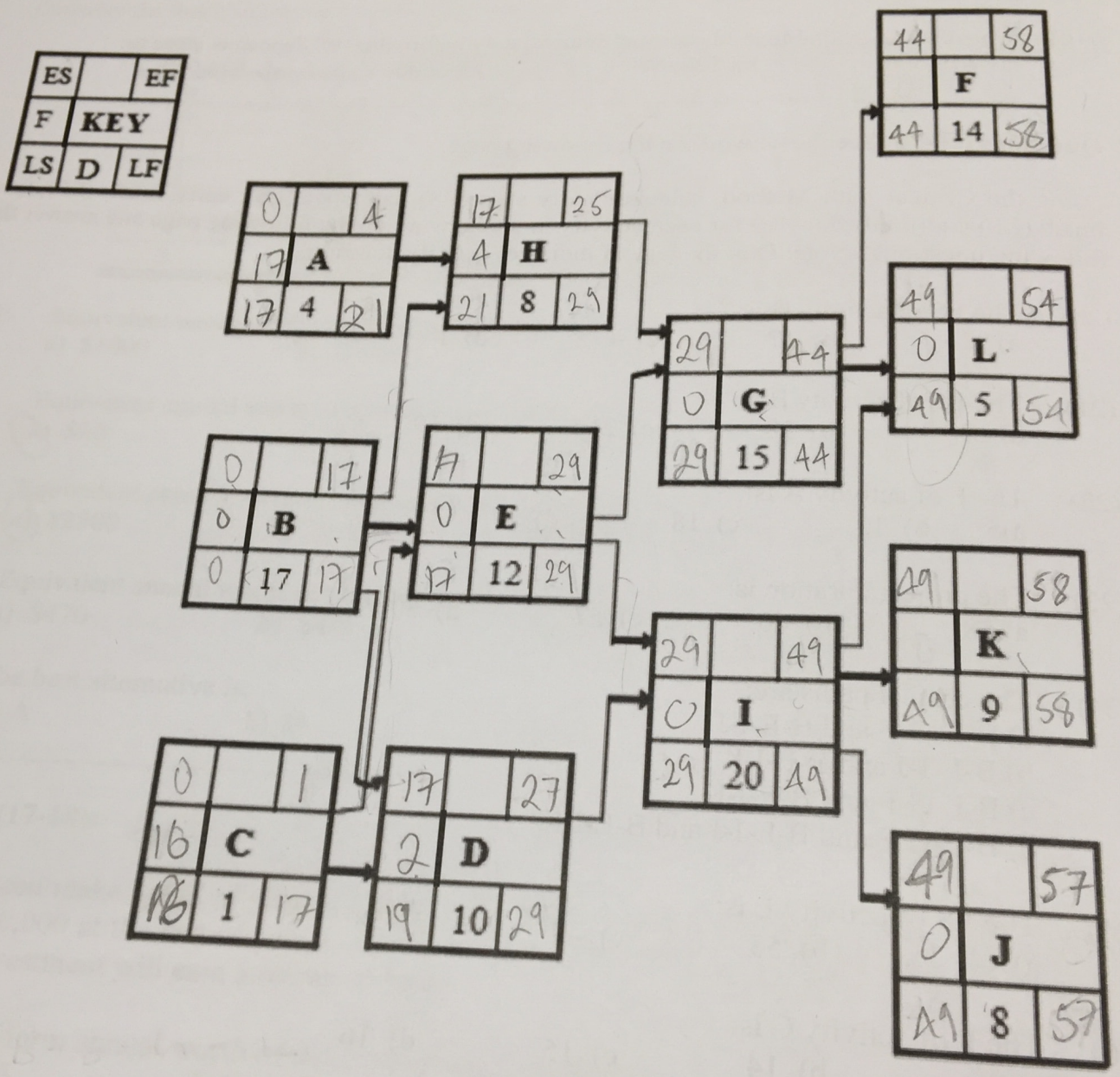
(23) The project duration is:
a) 58 b) 60 c) 57 d) 59

(24) The critical paths are:
a) B-E-G-F and B-E-I-J
b) B-E-I-J and B-E-I-K
c) B-E-G-F and B-E-I-K
d) B-E-G-F and B-E-I-J and B-E-I-K

(25) The LS of activity L is:
a) 44 b) 53 c) 49 d) 58

(26) The F of activity C is:
a) 0 b) 14 c) 15 d) 16

Network Diagram for questions (20-26):***Note: You may make notes in this diagram***



BEGF

BEIK

Questions (27-32):

The purchase price of a machine is $7500, its estimated salvage value is $3000, and its service life is 6 years. Please answer the following questions:

Using the straight line (SL) method:

(27) The yearly depreciation amount is close to:
a) $1000 b) $990 c) $750 d) $900

(28) The book value of the machine at the end of year 3 is close to:
a) $5250 b) $4800 c) $3900 d) $4700

Using the sum of years' digits (SOYD) method:

(29) The depreciation amount in the fourth year is close to:
a) $700 b) $580 c) $610 d) $640

(30) The book value of the machine at the end of year 4 is close to:
a) $3800 b) $3650 c) $3500 d) $3350

Using the double declining balance (DDB) method:

(31) The depreciation amount in the second year is close to:
a) $1700 b) $1550 c) $1600 d) $1670

(32) The book value of the machine at the end of year 4 is close to:
a) $1480 b) $1425 c) $972 d) $900

Questions (33-34):

(33) During the project planning and implementation phases, there is often a need to analyze several alternatives. The trade-offs, unlike selection of competing alternatives, are usually made between which factors:
a) Cost and benefits
b) Cost, schedule, and scope
c) Planning and implementation phases
d) Contract, project life cycle, and risk

(34) Which of the following statements concerning contract types is FALSE
a) For a lump sum contract, the contractor quotes one price which covers all work and services required by the contract plans and specifications
b) Unit Price Contracts are used for work where it is possible to calculate the exact quantity of materials that will be required
c) Unit Price Contracts have lower risk than lump sum contracts
d) In the Cost + Fixed Fee + Sliding Fee contract, the contractor will be penalized for cost overrun and rewarded for cost savings

Questions (35-41):

Consider the following two investments A and B with the following sequences of cash flows:

	Net Cash Flow	
n	A	B
0	–$100,000	–$120,000
1	$15,000	$20,000
2	$15,000	$20,000
3	$130,000	$120,000

(35) If i = 10%, then PW for alternative A is close to:
a) $20,984 b)$27,599 c) $22,738 d)$23,706

(36) If i = 20%, then PW for alternative A is close to:
a) –$1850 b) $2867 c)–$1975 d)–$1929

(37) Based on the previous two questions, the IRR for alternative A is close to:
a) 10.4% b) 19.2% c) 15.9% d) 17.5%

(38) If i = 10%, then PW for alternative B is close to:
a)$5870 b)$4865 c) $6005 d)$8900

(39) If i = 20%, then PW for alternative B is close to:
a) $25,690 b)$22,890 c)–$20,005 d)–$23,085

(40) Based on the previous two questions, the IRR for alternative B is close to:
a) 11.7% b) 13.8% c) 15.9% d)12.5%

(41) If MARR is 15%, which alternative is acceptable?
a) Alternative A
b) Alternative B
c)Reject both alternatives
d) Both alternatives A and B are equally preferable

Questions (42-43):

An engineer wants to purchase a house for $100,000 and has $20,000 cash to use as the down payment. The bank offers a loan for the remainder at 9% nominal interest with the term of the loan being 20 years.

Monthly payments for mortgage

(42) The effective interest rate is close to:
a) 9.2% b) 9.3% c) 9.4% d) 9.5%

(43) Assuming the payment is the same for all months, the monthly loan payment is close to:
a) $720 b) $572 c) $689 d) $741

Question (44)

The cost of a medium sized lathe in 2006 was $18,450. The Industrial Equipment Price Index in 2006 was 125. If the current price index is 174, the estimated cost of a similar size lathe is close to:

(44) a) $13,250 b) $14,350 c) $25,680 d) $27,490

Question (45)

At the beginning of 2005, your company purchased 15 tons of raw materials for $320,000. In January 2015, the same 15 tons of raw materials cost $385,000. The average inflation rate over this period is close to:

(45) a) 2.1% b) 1.9% c) 1.8% d) 2.0%

Questions (46-49):

C.W. Piping manufacturing company produces PVC pipes and drainage ducts for use in the agriculture industry. The table belowshows a list of the major equipment currently owned by the company and current book value.

Equipment	*Book Value*	*CCA Class*	*CCA Rate*
2 Trucks	$30,000	16	40%
1 Fork Lift	$14,000	38	30%
Poly Vinyl Patent	$10,000	44	25%
1 Factory Building	$240,000	1	4%

(46) The company's undepreciated capital cost at the beginning of the current year is close to:
a) $114,710 b)$186,010 c)$294,060 d)$291,060

(47) The total depreciation deduction permitted at the end of the current year is close to:
a) $28,295 b) $114,713 c) $265,694 d)$2,948

(48) If the company purchases a second forklift for $12,000 at the beginning of next year, the depreciation deduction for asset class 38 at the end of next year is close to:
a) $3,640 b) $4,730 c) $5,900 d) $7,810

(49) Considering the purchase of the 2nd forklift, the book value of the company's assets at the end of next year is close to:
a) $242,670 b) $244,480 c) $288,150 d) $254,910

Questions (50-55):

Montreal Construction needs to replace one of their heavy machines. They are considering buying either Mach X or Mach Y, which have the following data:

Data	Mach X	Mach Y
Life, Years	8	6
First Cost (FC)	$255,000	$222,000
Annual Benefit(AB)	88,000	73,000
AB Gradient (AB_G)	1,300	1,200
Annual Maintenance &Operating Cost (M&O)	34,000	18,000
M&O Gradient ($M\&O_G$)	1,100	600
Salvage Value	48,000	42,000

The Accounting Department of Montreal Construction reveals that a loan must be secured to purchase any machine. The loan data are as follows:

Data	Mach X	Mach Y
Down Payment (% of FC)	25%	25%
Loan Period, Years	8	6
Annual Loan Payment	$33,208.75	$38,229.63

The loan payments will be made annually with 10% interest. Montreal Construction assumes MARR = 12%. Using the Net Present Worth (NPW) analysis, answer the following questions:

(50) The analysis period if you are going to use NPW is close to:
a) 12 years b) 18 years c) 21 years d) 24 years

(51) The interest rate that you are going to use in the calculation is:
a) 12% b) 10% c) 15% d) 25%

(52) The NPW for Mach X, using only 8 years cash flow, is close to:
a) $60,105 b) $61,810 c) $60,485 d) $62,500

(53) The NPW for Mach Y, using only 6 years cash flow, is close to:
a) $40,082 b) $45,506 c) $41,088 d) $38,350

(54) The NPW for Mach Y, using the analysis period, is close to:
a) $75,286 b) $70,513 c) $74,255 d) $71,919

(55) Recommend which machine to purchase:
a) Mach X b) Mach Y c) Both d) None

Summary of Useful Formulas for Discrete Models

Name	Symbol and Formula
Compound amount factor	$(F/P,i,N) = (1+i)^N$
Present worth factor	$(P/F,i,N) = \frac{1}{(1+i)^N}$
Sinking fund factor	$(A/F,i,N) = \frac{i}{(1+i)^N - 1}$
Uniform series compound amount factor	$(F/A,i,N) = \frac{(1+i)^N - 1}{i}$
Capital recovery factor	$(A/P,i,N) = \frac{i(1+i)^N}{(1+i)^N - 1}$
Series present worth factor	$(P/A,i,N) = \frac{(1+i)^N - 1}{i(1+i)^N}$
Arithmetic gradient to annuity conversion factor	$(A/G,i,N) = \frac{1}{i} - \frac{N}{(1+i)^N - 1}$
Arithmetic gradient to present worth conversion factor	$(P/G,i,N) = \frac{(1+i)^N - iN - 1}{i^2(1+i)^N}$
Geometric gradient to present worth conversion factor	$(P/A,g,i,N) = \frac{(P/A,i^o,N)}{1+g}$ $(P/A,g,i,N) = \left(\frac{(1+i^o)^N - 1}{i^o(1+i^o)^N}\right)\frac{1}{1+g}$ $i^o = \frac{1+i}{1+g} - 1$
Capitalized value formula	$P = \frac{A}{i}$
Capital recovery formula	$A = (P-S)(A/P,i,N) + Si$

Effective interest rate per year: $i_e = (1+r/m)^m - 1$

where r = nominal interest rate per year
m = number of compounding periods per year

Compound Interest Factors

10%	Single Payment		Uniform Payment Series				Arithmetic Gradient		10%
	Compound Amount Factor	Present Worth Factor	Sinking Fund Factor	Capital Recovery Factor	Compound Amount Factor	Present Worth Factor	Gradient Uniform Factor	Gradient Present Factor	
n	Find F Given P *F/P*	Find P Given F *P/F*	Find A Given F *A/F*	Find A Given P *A/P*	Find F Given A *F/A*	Find P Given A *P/A*	Find A Given G *A/G*	Find P Given G *P/G*	*n*
1	1.100	0.9091	1.0000	1.1000	1.000	0.909	0.000	0.000	1
2	1.210	0.8264	0.4762	0.5762	2.100	1.736	0.476	0.826	2
3	1.331	0.7513	0.3021	0.4021	3.310	2.487	0.937	2.329	3
4	1.464	0.6830	0.2155	0.3155	4.641	3.170	1.381	4.378	4
5	1.611	0.6209	0.1638	0.2638	6.105	3.791	1.810	6.862	5
6	1.772	0.5645	0.1296	0.2296	7.716	4.355	2.224	9.684	6
7	1.949	0.5132	0.1054	0.2054	9.487	4.868	2.622	12.763	7
8	2.144	0.4665	0.0874	0.1874	11.436	5.335	3.004	16.029	8
9	2.358	0.4241	0.0736	0.1736	13.579	5.759	3.372	19.421	9
10	2.594	0.3855	0.0627	0.1627	15.937	6.145	3.725	22.891	10
11	2.853	0.3505	0.0540	0.1540	18.531	6.495	4.064	26.396	11
12	3.138	0.3186	0.0468	0.1468	21.384	6.814	4.388	29.901	12
13	3.452	0.2897	0.0408	0.1408	24.523	7.103	4.699	33.377	13
14	3.797	0.2633	0.0357	0.1357	27.975	7.367	4.996	36.800	14
15	4.177	0.2394	0.0315	0.1315	31.772	7.606	5.279	40.152	15
16	4.595	0.2176	0.0278	0.1278	35.950	7.824	5.549	43.416	16
17	5.054	0.1978	0.0247	0.1247	40.545	8.022	5.807	46.582	17
18	5.560	0.1799	0.0219	0.1219	45.599	8.201	6.053	49.640	18
19	6.116	0.1635	0.0195	0.1195	51.159	8.365	6.286	52.583	19
20	6.727	0.1486	0.0175	0.1175	57.275	8.514	6.508	55.407	20

12%	Find F Given P	Find P Given F	Find A Given F	Find A Given P	Find F Given A	Find P Given A	Find A Given G	Find P Given G	12%
n	*F/P*	*P/F*	*A/F*	*A/P*	*F/A*	*P/A*	*A/G*	*P/G*	*n*
1	1.120	0.8929	1.0000	1.1200	1.000	0.893	0.000	0.000	1
2	1.254	0.7972	0.4717	0.5917	2.120	1.690	0.472	0.797	2
3	1.405	0.7118	0.2963	0.4163	3.374	2.402	0.925	2.221	3
4	1.574	0.6355	0.2092	0.3292	4.779	3.037	1.359	4.127	4
5	1.762	0.5674	0.1574	0.2774	6.353	3.605	1.775	6.397	5
6	1.974	0.5066	0.1232	0.2432	8.115	4.111	2.172	8.930	6
7	2.211	0.4523	0.0991	0.2191	10.089	4.564	2.551	11.644	7
8	2.476	0.4039	0.0813	0.2013	12.300	4.968	2.913	14.471	8
9	2.773	0.3606	0.0677	0.1877	14.776	5.328	3.257	17.356	9
10	3.106	0.3220	0.0570	0.1770	17.549	5.650	3.585	20.254	10
11	3.479	0.2875	0.0484	0.1684	20.655	5.938	3.895	23.129	11
12	3.896	0.2567	0.0414	0.1614	24.133	6.194	4.190	25.952	12
13	4.363	0.2292	0.0357	0.1557	28.029	6.424	4.468	28.702	13
14	4.887	0.2046	0.0309	0.1509	32.393	6.628	4.732	31.362	14
15	5.474	0.1827	0.0268	0.1468	37.280	6.811	4.980	33.920	15
16	6.130	0.1631	0.0234	0.1434	42.753	6.974	5.215	36.367	16
17	6.866	0.1456	0.0205	0.1405	48.884	7.120	5.435	38.697	17
18	7.690	0.1300	0.0179	0.1379	55.750	7.250	5.643	40.908	18
19	8.613	0.1161	0.0158	0.1358	63.440	7.366	5.838	42.998	19
20	9.646	0.1037	0.0139	0.1339	72.052	7.469	6.020	44.968	20

Compound Interest Factors

15%	Single Payment		Uniform Payment Series				Arithmetic Gradient		15%
	Compound Amount Factor	Present Worth Factor	Sinking Fund Factor	Capital Recovery Factor	Compound Amount Factor	Present Worth Factor	Gradient Uniform Factor	Gradient Present Factor	
	Find F Given P	Find P Given F	Find A Given F	Find A Given P	Find F Given A	Find P Given A	Find A Given G	Find P Given G	
n	*F/P*	*P/F*	*A/F*	*A/P*	*F/A*	*P/A*	*A/G*	*P/G*	*n*
1	1.150	0.8696	1.0000	1.1500	1.000	0.870	0.000	0.000	1
2	1.323	0.7561	0.4651	0.6151	2.150	1.626	0.465	0.756	2
3	1.521	0.6575	0.2880	0.4380	3.473	2.283	0.907	2.071	3
4	1.749	0.5718	0.2003	0.3503	4.993	2.855	1.326	3.786	4
5	2.011	0.4972	0.1483	0.2983	6.742	3.352	1.723	5.775	5
6	2.313	0.4323	0.1142	0.2642	8.754	3.784	2.097	7.937	6
7	2.660	0.3759	0.0904	0.2404	11.067	4.160	2.450	10.192	7
8	3.059	0.3269	0.0729	0.2229	13.727	4.487	2.781	12.481	8
9	3.518	0.2843	0.0596	0.2096	16.786	4.772	3.092	14.755	9
10	4.046	0.2472	0.0493	0.1993	20.304	5.019	3.383	16.979	10
11	4.652	0.2149	0.0411	0.1911	24.349	5.234	3.655	19.129	11
12	5.350	0.1869	0.0345	0.1845	29.002	5.421	3.908	21.185	12
13	6.153	0.1625	0.0291	0.1791	34.352	5.583	4.144	23.135	13
14	7.076	0.1413	0.0247	0.1747	40.505	5.724	4.362	24.972	14
15	8.137	0.1229	0.0210	0.1710	47.580	5.847	4.565	26.693	15
16	9.358	0.1069	0.0179	0.1679	55.717	5.954	4.752	28.296	16
17	10.761	0.0929	0.0154	0.1654	65.075	6.047	4.925	29.783	17
18	12.375	0.0808	0.0132	0.1632	75.836	6.128	5.084	31.156	18
19	14.232	0.0703	0.0113	0.1613	88.212	6.198	5.231	32.421	19
20	16.367	0.0611	0.00976	0.1598	102.444	6.259	5.365	33.582	20

20%	Find F Given P	Find P Given F	Find A Given F	Find A Given P	Find F Given A	Find P Given A	Find A Given G	Find P Given G	20%
n	*F/P*	*P/F*	*A/F*	*A/P*	*F/A*	*P/A*	*A/G*	*P/G*	n
1	1.200	0.8333	1.0000	1.2000	1.000	0.833	0.000	0.000	1
2	1.440	0.6944	0.4545	0.6545	2.200	1.528	0.455	0.694	2
3	1.728	0.5787	0.2747	0.4747	3.640	2.106	0.879	1.852	3
4	2.074	0.4823	0.1863	0.3863	5.368	2.589	1.274	3.299	4
5	2.488	0.4019	0.1344	0.3344	7.442	2.991	1.641	4.906	5
6	2.986	0.3349	0.1007	0.3007	9.930	3.326	1.979	6.581	6
7	3.583	0.2791	0.0774	0.2774	12.916	3.605	2.290	8.255	7
8	4.300	0.2326	0.0606	0.2606	16.499	3.837	2.576	9.883	8
9	5.160	0.1938	0.0481	0.2481	20.799	4.031	2.836	11.434	9
10	6.192	0.1615	0.0385	0.2385	25.959	4.192	3.074	12.887	10
11	7.430	0.1346	0.0311	0.2311	32.150	4.327	3.289	14.233	11
12	8.916	0.1122	0.0253	0.2253	39.581	4.439	3.484	15.467	12
13	10.699	0.0935	0.0206	0.2206	48.497	4.533	3.660	16.588	13
14	12.839	0.0779	0.0169	0.2169	59.196	4.611	3.817	17.601	14
15	15.407	0.0649	0.0139	0.2139	72.035	4.675	3.959	18.509	15
16	18.488	0.0541	0.0114	0.2114	87.442	4.730	4.085	19.321	16
17	22.186	0.0451	0.00944	0.2094	105.931	4.775	4.198	20.042	17
18	26.623	0.0376	0.00781	0.2078	128.117	4.812	4.298	20.680	18
19	31.948	0.0313	0.00646	0.2065	154.740	4.843	4.386	21.244	19
20	38.338	0.0261	0.00536	0.2054	186.688	4.870	4.464	21.739	20