SoftwarePolish

Rick Groszkiewicz
2964 Nestle Creek Drive
Marietta, GA 30062-4857

Voice/fax (770) 971-8913
email: rickg@softwarepolish.com
http://www.softwarepolish.com

FALL 1990 EA-2
EXAM SOLUTIONS

Last Revised 06/18/2002 (see next page)

These solutions use beginning of year amortization payments in setting up the Minimum Funding Standards Account. These solutions were prepared based on the law as in effect at June 30, 1990.

These solutions have been compared with those produced by other technical actuaries, and they represent my best understanding of the correct way to solve these problems. As usual, it seems easy to get an answer in the correct range as long as you are not actually taking the exam!

For problems involving the deductible limit you should use the following sequence of steps:

1. Calculate the normal cost plus limit adjustments with interest to the earlier of the end of the plan year or the end of the tax year.

2. Calculate the Full Funding Limitation under Section 404 with interest to the end of the plan year. If this is less than the result of step one, then you can skip to step four.

3. Calculate the absolute minimum amount necessary to produce a non-negative credit balance in the Minimum Funding Standards Account. This amount should never be based on the Alternative MFSA. This amount may be increased by the amount of any "includible employer contribution."

4. The maximum deductible limit is the greater of (1) and (3), but not greater than (2).

5. If the Unfunded Current Liability exceeds the final deductible limit and the plan has more than 100 participants, then the final deductible limit will be the UCL. This UCL limit is only available to non-multiemployer plans.

Revision History:

06/18/02 Clarified "step 5" for problems 4, 8, 15, 20, 24 and 31
07/09/01 Corrected answer range letters for problems 25 and 26
01/10/01 Corrected problem 31, page 1
07/30/00 Corrected problem 13, page 1, and problem 16, page 2
07/30/00 Corrected problem 31, page 1 and page 3
07/06/00 Corrected problem 15, page 1, and problem 18, page 1
11/10/98 Corrected answer range letter for problem 6
09/10/97 Corrected problem 25, page 1
09/10/97 Corrected problem 26
10/22/94 Corrected problem 9
10/24/93 Reflected corrected text in solutions to problems 10 and 23
11/06/93 Corrected answer range letters for problems 8, 18, and 26
09/27/92 Corrected problem 04, pages 1 and 2
10/25/92 Corrected problem 31, pages 1 through 4
11/14/92 Reflected corrected text in solutions to problems 4,8,15,20,24,31

Fall 1990 EA-2 Exam Solutions

Problem 1

When the interest rate changes, there are two effects on the MFSA. One is that there is a new base equal to the change in the UAL that must be amortized over 10 years (post PPA '87). The second effect is that any existing MFSA amortization amounts must be recalculated. The new amounts equal the outstanding base divided by an annuity at the new interest rate for the number of years remaining in the amortization period.

You can calculate the outstanding amount of the IAL base using the equation of balance at 12/31/89 under the old interest rate:

UAL = O/S 412 bases - CB
= 300,000 = OSB - 30,000
O/S 412 bases = 330,000

new base = 200,000 - 300,000
= -100,000

The amortization for the IAL base was 30 years at 01/01/84. Since no other changes have occurred, the 330,000 base represents the outstanding portion of the initial IAL. It should be amortized over 30 - (90 - 84), or 24 years.

amortization for IAL base = $330{,}000 \div \ddot{a}_{\overline{24}|.08} = 29{,}021$

amortization for Assump base = $100{,}000 \div \ddot{a}_{\overline{10}|.08} = 13{,}799$

Minimum Funding Standards Account for 1990

Charges		Credits	
Normal cost	90,000	Credit balance	30,000
IAL amort	29,021	Assump amort	13,799
		12/31 contrib	x
Interest	9,522	Interest	3,504
	128,543		x+47,303

The minimum contribution at 12/31/90 is 128,543 - 47,303 = 81,240.

answer is D

Fall 1990 EA-2 Exam Solutions

Problem 2 - Page 1

There are two ways to work this problem. The short way is to calculate the credit balance directly as the difference between the UAL and the outstanding 412 amortization bases at 12/31/90. The long way is to construct the Minimum Funding Standards Account values for 1989 and 1990.

The deductible limit is constrained by the Full Funding Limits under 404 and 412, as well as the minimum funding requirement under 412. Since you have none of the information to calculate these numbers, simply calculate the deductible limit as the normal cost plus limit adjustments with interest to the end of the plan year.

Since the deductible limit for 1989 was paid at 12/31/89, the UAL at 12/31/89 should equal the remaining nine years of a ten year amortization of the IAL:

$$12/31/89\ UAL = 500{,}000 * \left(\ddot{a}_{\overline{9}|.07} \div \ddot{a}_{\overline{10}|.07} \right) = 463{,}811$$

The plan amendment at 01/01/90 increases the UAL at that date by 10%. Change in 01/01/90 UAL = 10%(463,811) = 46,381. Since the deductible limit for 1990 was paid at 12/31/90, the UAL at 12/31/90 should equal the appropriate remaining pieces of a ten year amortization of the IAL and the plan change:

$$\begin{aligned} 12/31/90\ UAL &= 500{,}000 * \left(\ddot{a}_{\overline{8}|.07} \div \ddot{a}_{\overline{10}|.07} \right) \\ &+ 46{,}381 * \left(\ddot{a}_{\overline{9}|.07} \div \ddot{a}_{\overline{10}|.07} \right) \\ &= 425{,}089 + 43{,}024 = 468{,}113 \end{aligned}$$

$$\begin{aligned} 12/31/90\ O/S\ 412\ bases &= 500{,}000 * \left(\ddot{a}_{\overline{28}|.07} \div \ddot{a}_{\overline{30}|.07} \right) \\ &+ 46{,}381 * \left(\ddot{a}_{\overline{29}|.07} \div \ddot{a}_{\overline{30}|.07} \right) \\ &= 489{,}043 + 45{,}890 = 534{,}933 \end{aligned}$$

UAL = O/S 412 bases - CB
CB = O/S 412 bases - UAL
= 534,933 - 468,113 = 66,820

answer is D

Problem 2 - Page 2

The alternate solution is to work the problem the long way, which requires calculation of the deductible limit and construction of the Minimum Funding Standards Account values for 1989 and 1990. The deductible limit can be simplified to the normal cost plus limit adjustments with interest to the end of the plan year:

$$NC + LA = 1.07 \left(NC + 500{,}000 \div \ddot{a}_{\overline{10}|.07} \right)$$
$$= 1.07NC + 71{,}189$$

MFSA IAL amortization charge is $500{,}000 \div \ddot{a}_{\overline{30}|.07} = 37{,}657$

Minimum Funding Standards Account for 1989

Charges		Credits	
Normal cost	NC	Credit balance	-0-
IAL amort	37,657	12/31 contrib	1.07NC+71,189
Interest	.07NC+2,636	Interest	-0-
	1.07NC+40,293		1.07NC+71,189

The credit balance at 12/31/89 is 71,189 - 40,293 = 30,896. To calculate the 1990 deductible limit and MFSA amortizations, you must determine the UAL at 12/31/89:

$$UAL = (1+i)(UAL_0 + NC_0) - (\text{Contribution} + \text{interest})$$
$$UAL = 1.07 \left(500{,}000 + NC \right) - \left(1.07NC + 71{,}189 \right)$$
$$= 463{,}811$$

01/01/90 change in UAL = 10%(463,381) = 46,381

$$NC + LA = 1.07 \left(NC + (500{,}000 + 46{,}381) \div \ddot{a}_{\overline{10}|.07} \right)$$
$$= 1.07NC + 77{,}792$$

MFSA plan amendment amortization charge $46{,}381 \div \ddot{a}_{\overline{30}|.07} = 3{,}493$

Minimum Funding Standards Account for 1990

Charges		Credits	
Normal cost	NC	Credit balance	30,896
IAL amort	37,657	12/31 contrib	1.07NC+77,792
Plan chg amort	3,493		
Interest	.07NC+2,881	Interest	2,163
	1.07NC+44,031		1.07NC+110,851

The credit balance at 12/31/89 is 110,851 - 44,031 = 66,820.

Fall 1990 EA-2 Exam Solutions

Problem 3

This is tricky Section 415 benefit calculation problem. The first step is to calculate the basic plan benefits. Next, the 415 limits must be applied. Since this participant was born after 1954, the limits for a Social Security Retirement Age of 67 are used.

The dollar maximum of 102,582 at age 67 has to be adjusted to reflect payment of benefits at the normal retirement age of 55. The dollar limit is reduced 6.667% for the first three years and then 5% for the rest of the years of age down to age 52. Prior to age 62, the benefit must be actuarially reduced. Since this plan has no pre-retirement death benefits, the actuarial reduction takes mortality into account; the calculation uses N62/Nx. If the plan had a pre-retirement death benefit equal to 100% of the present value of the accrued benefit, then the actuarial reduction would ignore mortality.

The overall 415 limit is defined as the lesser of 102,582 or 100% of 3 year FAE. The application of the 415 limits can not reduce the benefit below 10,000. The dollar maximum must be reduced pro-rata for less than 10 years of participation service. The other two limits would be reduced pro-rata for less than 10 years of service from hire. Since the plan was set up at 01/01/85, the employee has six years of participation at 12/31/90.

	Accrued Benefit as of 12/31/90	
Years of service	7	
FAE5 = (50+60+70+80+90)*1,000/5	70,000	
$70,000 * service * 6%	29,400	Plan accrued benefit
100% 3 yr FAE = (70+80+90)*1,000/3	80,000	
Pro-rate for years of service < 10	56,000	= 80,000 * (7/10)
102,582 maximum at age 67	102,582	
Reduce 6.667%/yr first 3 years and 5.000%/yr down to age 62	71,807	= 102,582*.70
Actuarial reduction from 62 to 55	39,494	= $71,807*(N^{(12)}_{62} \div N^{(12)}_{55})$
Years of participation	6	
Pro-rate for years of participation < 10	23,696	= 39,494 * (6/10)
10,000 minimum	10,000	
Pro-rate for years of service < 10	7,000	= 10,000 * (7/10)
Lesser of plan ben, or greater of (415 floor and lesser of 415 dollar or FAE3 maximums)	23,696	

answer is B

Fall 1990 EA-2 Exam Solutions

Revised
06/18/02

Problem 4 - Page 1

For problems involving the deductible limit you should use the following sequence of steps:

1. Calculate the normal cost plus limit adjustments with interest to the earlier of the end of the plan year or the end of the tax year.
2. Calculate the absolute minimum amount necessary to produce a non-negative credit balance in the Minimum Funding Standards Account. This amount should never be based on the Alternative MFSA. This amount may be increased by the amount of any "includible employer contribution."
3. Calculate the Full Funding Limitation under Section 404 with interest to the end of the plan year.
4. The maximum deductible limit is the greater of (1) and (2), but not greater than (3).
5. If the Unfunded Current Liability exceeds the final deductible limit and the plan has more than 100 participants, then the final deductible limit will be the UCL.

You can use the 18,000 normal cost under both IRC Sections 404 and 412 because the funding method is FIL. The reason is that both the UAL and the AAV would be adjusted by the carryover contribution for the 404 normal cost calculation, which produces the same value for PVNC.

You must determine the Initial Accrued Liability in order to calculate the limit adjustments for the deductible limit. The 11,000 amortization charge was set up as a thirty year amortization of the IAL at 01/01/84:

$$IAL = 11{,}000 \times \ddot{a}_{\overline{30}|.08} = 133{,}742$$

$$\text{Normal cost + Limit adjustments} = 1.08 \left(18{,}000 + 133{,}742 \div \ddot{a}_{\overline{10}|.08} \right)$$
$$= 39{,}372$$

Since you are given the Entry Age Normal valuation results and the current liability, you should calculate the Full Funding Limitation. With any aggregate method, you must use the Entry Age Normal method to calculate the FFL.

Revenue Ruling 82-125 clarifies the handling of the Full Funding Limitation for the deductible limit when carryover contributions are present. The Full Funding Limitation is always adjusted with interest to the end of the year. Any carryover contribution should not receive interest for the FFL, and it should be subtracted from the assets (excluding the carryover) adjusted with interest to the end of the year.

"old" IRC 404 FFL = (1+i)(NC+AL-lesser[MV,AAV])+carry
= 1.08 (14,000 + 110,000 - 100,000) + 5,000
= 30,920

Problem 4 - Page 2

"new" IRC 404 FFL = (1+i)(1.5{CLNC+CLAL}-lesser[MV,AAV])+carry
= 1.5(86,000) - 105,000 + 5,000
= 29,000

Notice the tricky calculation of the "new" FFL that is necessary since you are given the current liability and asset value at year end! Now you must set up the 1989 Minimum Funding Standards Account. You should calculate the minimum funding requirement under step 3 above, and see if a Full Funding Credit will occur in the MFSA. The final step is to calculate the credit balance at the end of the year.

Minimum Funding Standards Account for 1989

Charges		Credits	
Normal cost	18,000	Credit balance	10,000
IAL amort	11,000	12/31 MFR	x
Interest	2,320	Interest	800
	31,320		x+10,800

Based on the 12/82 proposed regulation, the Accumulated Funding Deficiency based on no contribution and no credit balance must be calculated. This is simply the charges of 31,320 in this problem.

Next the FFL is calculated under 412. The definition is similar to that under 404, except that the asset value is adjusted by the credit balance.

"old" IRC 412 FFL = (1+i)(NC+AL)-(lesser[MV,AAV]-CB)
= 1.08 (14,000 + 110,000 - (100,000-10,000))
= 36,720

"new" IRC 412 FFL = (1+i)(1.5[CLNC+CLAL])-(1+i)(lesser[MV,AAV]-CB)
= 1.5(86,000) - (105,000-10,000(1.08))
= 34,800

The 412 FFL credit is defined as the excess of the accumulated funding deficiency based on zero contribution and zero credit balance over the FFL. This excess is zero, so there is no Full Funding credit for 1989.

The minimum funding requirement for 1989 is 31,320 - 10,800 = 20,520. The deductible limit for 1989 is the lesser of the 404 FFL of 29,000, and the greater of the 20,520 MFR or the NC+LA of 39,372. The 29,000 FFL is the final deductible limit, and the contribution paid at 12/31/89 is 24,000. The credit balance at 12/31/89 equals the credits of 10,800 plus 24,000 less the charges of 31,320 = 3,480.

answer is B

Fall 1990 EA-2 Exam Solutions

Problem 5

The easy part of the problem is calculation of the normal cost plus limit adjustments under the fresh start approach. Simply treat the new 410,000 UAL as the starting point and calculate the deductible limit:

$$NC + LA = 1.08 \left(33{,}000 + 410{,}000 \div \ddot{a}_{\overline{10}|.08} \right)$$
$$= 35{,}640 + 61{,}102 = 96{,}742$$

The calculation of the limit adjustment under the traditional approach requires recalculation of the limit adjustment for the outstanding amount of the IAL. The regulation at 1.404(a)-14(h) contains rules for maintenance of 10-year amortization bases used to calculate the deductible limit.

In this problem, we have a single 404 base of 467,000 at 01/01/90. The change in interest rate produces a new 404 base of -57,000 at 01/01/89. The limit adjustment on the "old" base must be recalculated on the 8% interest rate.

You must calculate the number of years of amortization remaining in the original 404 base at the old interest rate. The original limit adjustment was calculated as

$$LA = 800{,}000 \div \ddot{a}_{\overline{10}|.07} = 106{,}450$$

The outstanding 404 base of 467,000 should equal the present value of the limit adjustment for the remaining number of years:

$$106{,}450 * \ddot{a}_{\overline{n}|.07} = 467{,}000$$

$$\ddot{a}_{\overline{n}|.07} = 4.39 = 1.07(1-v^n)/.07$$

$$1-v^n = .29 \quad \Rightarrow \quad v^n = .71$$

$$n[\log(v)] = \log(.71) \quad \Rightarrow \quad -n[\log(1.07)] = \log(.71)$$
$$n = -\log(.71) \div \log(1.07) = 5.00$$

Now calculate the new limit adjustments for both bases on 8% interest:

$$\text{Limit adjustment for IAL base} = 467{,}000 \div \ddot{a}_{\overline{5}|.08} = 108{,}299$$
$$\text{Limit adjustment for chg base} = -57{,}000 \div \ddot{a}_{\overline{10}|.08} = -7{,}865$$

Normal cost plus Limit adjustments at 8% interest:

$$= 1.08 \left(33{,}000 + 108{,}299 - 7{,}865 \right) = 144{,}109$$

The difference in the deductible limits calculated under the traditional approach and the fresh start approach is 144,109 - 96,742 = 47,367.

answer is D

Fall 1990 EA-2 Exam Solutions

Revised 11/10/98

Problem 6

As stated in the problem, the regulations under IRC Section 414 specify that when a merger satisfies the de minimis rule, none of the MFSA items must be handled separately. Instead, the effect of the merger is treated as an experience gain or loss. This means that Plan A's MFSA items are maintained, and a new G/L base is created. All of Plan B's MFSA items are discarded.

For Plan A before the spinoff, the equation of balance gives

UAL = O/S 412 bases - CB
300,000 = OSB - 50,000
O/S 412 bases = 350,000

After the merger, a new base must be set up to force the equation of balance to be true for the merged plans A and B.

UAL = O/S 412 bases - CB
UAL + CB = O/S 412 bases

320,000 + 50,000 = 350,000 + new base
new base = 370,000 - 350,000
= 20,000 loss

Note that this base equals the UAL for Plan B. The amortization period for the new base is 5 years, since it is treated as an experience gain. The amortization for the IAL base was 30 years at 01/01/80. Since no other experience G/L have occurred, the 350,000 base represents the outstanding portion of the initial IAL. It should be amortized over 30 - (89 - 80), or 21 years:

amortization for IAL base = $350{,}000 \div \ddot{a}_{\overline{21}|.08} = 32{,}353$

amortization for loss base = $20{,}000 \div \ddot{a}_{\overline{5}|.08} = 4{,}638$

Minimum Funding Standards Account for 1989

Charges		Credits	
Normal cost	100,000	Credit balance	50,000
IAL amort	32,353		
Loss amort	4,638	Min contrib 12/31	x
Interest	10,959	Interest	4,000
	147,950		54,000+x

The minimum contribution required under 412 is one that results in a zero credit balance:

147,950 = 54,000 + x x = 93,950

answer is D

Fall 1990 EA-2 Exam Solutions

Problem 7 - Page 1

The three benefit accrual rules must be tested for each formula. For a formula to fail the tests, it has to fail all three rules. For each of these tests the projected NRB is based on service continuing to NRA.

411(b)(1)(A) Three percent Rule

The minimum accrued benefit is 3% times years of participation (< 33.33) times the projected NRB. The NRB is based on the earliest possible entry age, with service to the earlier of 65 or NRA. If benefits are based on pay, use the highest 10 year final average earnings.

411(b)(1)(B) 133 1/3 percent Rule

The rate of benefit accrual for later plan years can't exceed 133 1/3 percent of the rate for earlier plan years. Any amendment to the plan which is in effect for the current year should be treated as in effect for all plan years.

411(b)(1)(C) Fractional Rule

The minimum accrued benefit is a fraction times the NRB. The NRB is based on level future pay equal to compensation that would be used to calculate the NRB for exit today. The fraction is the ratio of years of participation at separation to years of participation at NRA.

I. 1.0% for first 10 years, 1.5% for next 20 years, 0% thereafter

This formula does not satisfy the 3% rule. The projected NRB for a participant who enters before age 35 is 1%(10) + 1.5%(20) which equals 40%. The benefits should accrue at the rate of .03(40%) or 1.2% per year. The actual accrued benefit after one year of service is only 1% of pay.

This formula does not satisfy the 133 1/3% rule, since 1.5% is more than 1.333 * 1.0% = 13.3%.

This formula does not satisfy the fractional rule. The projected NRB for a participant who enters at age 35 is 1%(10) + 1.5%(20) which equals 40%. The minimum accrued benefit after one year of service should be 40% * (1 / 30) = 1.33%, but the actual accrued benefit after one year of service is only 1% of pay.

Problem 7 - Page 2

II. 1.0% for first 20 years, 1.5% for next 10 years, 0% thereafter

This formula does not satisfy the 3% rule. The projected NRB for a participant who enters before age 35 is 1%(20) + 1.5%(10) which equals 35%. The benefits should accrue at the rate of .03(35%) or 1.05% per year. The actual accrued benefit after one year of service is only 1% of pay.

This formula does not satisfy the 133 1/3% rule, since 1.5% is more than 1.333 * 1.0% = 13.3%.

This formula does not satisfy the fractional rule. The projected NRB for a participant who enters at age 35 is 1%(20) + 1.5%(10) which equals 35%. The minimum accrued benefit after one year of service should be 35% * (1 / 30) = 1.05%, but the actual accrued benefit after one year of service is only 1% of pay.

III. 1.0% for first 10 years, 1.25% for next 10 years, 1.5% for next 10 years, 0% thereafter

This formula does not satisfy the 3% rule. The projected NRB for a participant who enters before age 35 is 1%(10) + 1.25%(10) + 1.5%(10) which equals 37.5%. The benefits should accrue at the rate of .03(37.5%) or 1.13% per year. The actual accrued benefit after one year of service is only 1% of pay.

This formula does not satisfy the 133 1/3% rule, since 1.5% is more than 1.333 * 1.0% = 13.3%.

This formula does not satisfy the fractional rule. The projected NRB for a participant who enters at age 35 is 1%(10) + 1.25%(10) + 1.5%(10) which equals 37.5%. The minimum accrued benefit after one year of service should be 37.5% * (1 / 30) = 1.25%, but the actual accrued benefit after one year of service is only 1% of pay.

None of the formulas satisfy the minimum benefit accrual rules.

answer is E

Fall 1990 EA-2 Exam Solutions

Revised
06/18/02

Problem 8

For problems involving the deductible limit you should use the following sequence of steps:

1. Calculate the normal cost plus limit adjustments with interest to the earlier of the end of the plan year or the end of the tax year.
2. Calculate the absolute minimum amount necessary to produce a non-negative credit balance in the Minimum Funding Standards Account. This amount should never be based on the Alternative MFSA. This amount may be increased by the amount of any "includible employer contribution."
3. Calculate the Full Funding Limitation under Section 404 with interest to the end of the plan year.
4. The maximum deductible limit is the greater of (1) and (2), but not greater than (3).
5. If the Unfunded Current Liability exceeds the final deductible limit and the plan has more than 100 participants, then the final deductible limit will be the UCL.

Section 404 deductible limit calculations

For a plan year starting 01/01/90, the deductible limit is calculated for the tax year starting 04/01/89. The deductible limit will get a partial year's interest from 01/01/90 to 03/31/90.

Normal cost plus Limit adjustments

$= (1 + .08[3/12]) (50{,}000 + [600{,}000 + 100{,}000] \div \ddot{a}_{\overline{10}|.08})$

$= 1.02 (50{,}000 + 96{,}593) = 149{,}525$

Since you do not know the market value of assets, the Full Funding Limitation can be ignored for this problem.

Section 412 minimum contribution calculations

The amortization of the IAL under Section 412 is based on 30 years, and the experience loss is amortized over 5 years:

$600{,}000 \div \ddot{a}_{\overline{30}|.08} = 49{,}349$ $\qquad$ $100{,}000 \div \ddot{a}_{\overline{5}|.08} = 23{,}190$

Minimum Funding Standards Account for 1990

Charges		Credits	
Normal cost	50,000	Credit balance	20,000
IAL amort	49,349	07/01 contrib	149,525
Loss amort	23,190		
Interest	9,803	Interest	7,581
	132,342		177,106

The credit balance at 12/31/90 equals 177,106 - 132,342 = 44,764.

answer is B

Fall 1990 EA-2 Exam Solutions

Revised
10/22/94

Problem 9

The plan's accrued benefit at 12/31/90 is equal to Smith's 3 year final average earnings times 1.25% times service from the 01/01/85 hire date:

```
FAE3     = ( 28,000 + 30,000 + 35,000 ) ÷ 3
         =   31,000
Plan AB  =   31,000(.0125)(6)
         =    2,325
```

In IRC Section 416, the Top Heavy minimum benefit is defined as 2% times Top heavy earnings averaged over five years times T-H service (up to a maximum of ten years). The plan has been T-H since 01/01/86, so the T-H minimum will be based on five years of T-H service at 12/31/90:

```
FAE5     = ( 20,000 + 23,000 + 28,000 + 30,000 + 35,000 ) ÷ 5
         =   27,200
T-H min  =   27,200(.02)(5)
         =    2,720
```

The 415 limits should be checked to be sure they don't limit the benefit:

```
415(b)(1)(A) dollar limit = 102,582 * (5/10) = 51,291
415(b)(1)(B)  FAE3  limit =  31,000 * (6/10) = 18,600
```

The 415 limits do not apply, so the final accrued benefit is 2,720.

answer is C

Fall 1990 EA-2 Exam Solutions

Problem 10

To calculate the required quarterly contribution, you must first calculate the required annual payment (RAP). This is the lesser of last year's minimum required contribution or 90% of this year's. These numbers are both interest adjusted to the first day of this plan year, and they both would not reflect any credit balance.

1989 "minimum requirement" at 12/31/89 = 114,133

amortization for IAL base = $350{,}000 \div \ddot{a}_{\overline{30}|.07} = 26{,}360$

1990 "minimum requirement" at 01/01/90 = 96,360 = 70,000 + 26,360
RAP = lesser of 1989 or 90% of 1990 = 86,724

The required quarterly contribution is based on the applicable percentage multiplied by the RAP. The applicable percentage is 6.25% in 1989, 12.50% in 1990, 18.75% in 1991, and 25% in 1992. The initial calculation of the required quarterly is .125(86,724) = 10,841.

If you stop here, you've been had! The trick is that you now get to take credit for the credit balance at 01/01/90 as if it was a payment toward the required quarterly contribution. The net amount you have to pay into the trust is the 10,841 reduced by the credit balance plus interest to 04/15/90:

$1{,}934(1.07)^{3.5/12} = 1{,}973$

Required additional payment = 10,841 - 1,973 = 8,868.

answer is C

Fall 1990 EA-2 Exam Solutions

Problem 11

I. TRUE

In the reasonable funding methods regulation at 1.412(c)(3)-1(d)(1), the general rule is that a valuation may not take benefit increases after the end of the plan year into account. A plan that provides for scheduled automatic increases in the 415 limits may take into account for the full plan year the amount of the 415 limits in effect on the last day of the plan year.

II. TRUE

Revenue Procedure 80-50 specifies this requirement for a change to the ILP method. After the first year, the allocation can be on any reasonable basis.

III. TRUE

The reasonable funding methods regulation at 1.412(c)(3)-1(d)(2) allows you to include employees who have already been hired, but will not be eligible until a future plan year. Conversely, you can limit the valuation population to only the employees who have satisfied the minimum age and service requirements of the plan.

All three items are true.

answer is D

Fall 1990 EA-2 Exam Solutions

Problem 12

The calculation of the deductible limit requires recalculation of the limit adjustment for the outstanding amount of the IAL. The regulation at 1.404(a)-14(h) contains rules for maintenance of 10-year amortization bases used to calculate the deductible limit.

In this problem, we have a single 404 base of unknown amount at 01/01/90. You are told that the deductible limit on the 8% interest basis is 65,000 and that the FFL does not apply.

The change in interest rate produces a new 404 base of 50,000 at 01/01/90. The limit adjustment on the "old" base must be recalculated on the 7% interest rate to give the deductible limit for 1990.

Since the deductible limits have been paid at 12/31 of each year, the UAL at 12/31/89 should equal the appropriate remaining amount of a ten year amortization of the IAL. The number of years of amortization remaining in the original 404 base at the old interest rate should be exactly 7:

$$\text{O/S 404 base} = \text{UAL} = \ddot{a}_{\overline{7}|.08} \left(\text{IAL} \div \ddot{a}_{\overline{10}|.08} \right)$$

You can calculate the original limit adjustment based on the 8% interest rate. Then the O/S 404 base can be calculated directly:

$$65{,}000 = 1.08\left(30{,}000 + \text{IAL} \div \ddot{a}_{\overline{10}|.08} \right)$$

$$30{,}185 = \text{IAL} \div \ddot{a}_{\overline{10}|.08}$$

$$\text{O/S 404 base} = \ddot{a}_{\overline{7}|.08} \left(30{,}185 \right) = 169{,}728$$

Now calculate the new limit adjustments for both bases on 7% interest:

$$\text{Limit adjustment for IAL base} = 169{,}728 \div \ddot{a}_{\overline{7}|.07} = 29{,}433$$
$$\text{Limit adjustment for chg base} = 50{,}000 \div \ddot{a}_{\overline{10}|.07} = 6{,}653$$

Normal cost plus Limit adjustments at 7% interest:

$$= 1.07 \left(35{,}000 + 29{,}433 + 6{,}653 \right) = 76{,}062$$

answer is D

Fall 1990 EA-2 Exam Solutions

Revised
07/30/00

Problem 13

The problem states that a partial withdrawal occurred at 12/31/90. You first have to determine whether a 70% decline has occurred. If so, then there are two aspects of the solution that would be different. The first is that the initial year of the three year testing period would be considered as the year of withdrawal in a partial withdrawal calculation. The second is that the denominator of the fraction that is multiplied by the withdrawal liability equals the average base units during the five year period preceding the three year testing period.

The three year test period is 1988 to 1990. The base units for the "high base year" is the average of the two highest years in the preceding five year period (which are 1983 and 1984) which equals ½(600,000+500,000) = 550,000. 30% of the units for the "high base year" equals .30(550,000) = 165,000. Since the units for each year in the three year testing period are all not less than 165,000, a 70% decline has not occurred.

To calculate the partial withdrawal liability, a fraction is applied to the withdrawal liability that would otherwise be calculated. You are told that the liability for Employer A for a complete withdrawal at 12/31/90 would be 250,000. Now a fraction must be applied, which is one minus the ratio of (i) the base units for the plan year following the plan year of partial withdrawal to (ii) the average base units during the five year period preceding the plan year of partial withdrawal:

250,000 (1 - 150,000 ÷ [.20(450,000+400,000+350,000+300,000+250,000)]) =
250,000 (1 - 150,000 ÷ 350,000) =
250,000 (.5714) = 142,857

answer is B

Fall 1990 EA-2 Exam Solutions

Problem 14

The point of this question is that the asset valuation method has been changed from an average of book and market value to market value of assets. This is a change in cost method as defined in Rev. Proc. 85-29.

Under the old asset valuation method, the initial asset value is

.5(500,000+750,000) = 625,000

But the actuarial asset value is always limited to be within 20% of the market value of assets. This means that the old AAV equals the lesser of 625,000 and 1.2(500,000), or 600,000. The new AAV is the market value of 500,000, and the effect of the change is a decrease in AAV of 100,000.

12/31/88 UAL = O/S 412 bases - CB
= $\ddot{a}_{\overline{20}|.07}$ * (500,000 ÷ $\ddot{a}_{\overline{30}|.07}$) - 30,000
= 11.3356 * 37,657 - 30,000 = 396,867

01/01/89 UAL = 396,867 + 100,000 = 496,867

Revenue Procedure 85-29 contains the rules for setting up a new amortization base when there is a change in cost method. For a credit base, the amortization period is 30 years. For a charge base, the amortization period is the greater of IAL period (30 - (89-79) = 20 years, or lesser of (15 or PVL/L). Final result is 20 years.

CHG amortization payment = 100,000 ÷ $\ddot{a}_{\overline{20}|.07}$ = 8,822

PVNC = PVFB - AAV - UAL
= 2,000,000 - 500,000 - 496,867 = 1,003,133
PVE/E= 3,000,000 ÷ 300,000 = 10.000
NC = 1,003,133 ÷ 10.0000 = 100,313 at 01/01/89

Minimum Funding Standards Account for 1989

Charges		Credits	
Normal cost	100,313	Credit balance	30,000
IAL amort	37,657		
CHG amort	8,822	Min contrib 12/31	x
Interest	10,275	Interest	2,100
	157,068		32,100+x

The minimum contribution required under 412 is one that results in a zero credit balance:

157,068 = 32,100 + x x = 124,968

answer is B

If you forget to limit the AAV to 120% of market value, you still get B!

Fall 1990 EA-2 Exam Solutions

Revised
06/18/02

Problem 15 - Page 1

For problems involving the deductible limit you should use the following sequence of steps:

1. Calculate the normal cost plus limit adjustments with interest to the earlier of the end of the plan year or the end of the tax year.
2. Calculate the absolute minimum amount necessary to produce a non-negative credit balance in the Minimum Funding Standards Account. This amount should never be based on the Alternative MFSA. This amount may be increased by the amount of any "includible employer contribution."
3. Calculate the Full Funding Limitation under Section 404 with interest to the end of the plan year.
4. The maximum deductible limit is the greater of (1) and (2), but not greater than (3).
5. If the Unfunded Current Liability exceeds the final deductible limit and the plan has more than 100 participants, then the final deductible limit will be the UCL.

The key to this problem is that you should not assume the Alternative MFSA is used in 1990 for step 2. This is based on the regulations at 1.404(a)-14(e)(2). You should do the MFSA calculations as if the plan switched back from the alternative MFSA to the regular MFSA. The effect is to increase the deductible limit for the year if the minimum funding requirement in step 2 is greater than item 1.

Section 404 deductible limit calculations

Since you have no information on the market value of assets, you must ignore the Full Funding Limitation in this problem. In order to calculate the limit adjustment, you must determine the amount of the IAL. Use the equation of balance, but treat the funding deficiency as a negative credit balance:

$$\text{UAL} = \text{O/S 412 bases} + \text{DB} = 30{,}000$$
$$= (\text{IAL} \div \ddot{a}_{\overline{30}|.07}) * \ddot{a}_{\overline{24}|.07} + 15{,}000$$
$$\text{IAL} = 15{,}000 * (\ddot{a}_{\overline{30}|.07} \div \ddot{a}_{\overline{24}|.07}) = 16{,}229$$

Normal cost plus Limit adjustments

$$= 1.07 (20{,}000 + 16{,}229 \div \ddot{a}_{\overline{10}|.07})$$
$$= 1.07 (20{,}000 + 2{,}159)$$
$$= 23{,}711$$

Problem 15 - Page 2

Section 412 minimum contribution calculations

The amortization of the IAL under Section 412 is based on 30 years:

IAL amortization = $16,229 \div \ddot{a}_{\overline{30}|.07} = 1,222$

AMFSA switch-back = $15,000 \div \ddot{a}_{\overline{5}|.07} = 3,419$

Minimum Funding Standards Account for 1990

Charges		Credits	
Debit balance	15,000	Credit balance	0
Normal cost	20,000		
IAL amort	1,222	Min contrib 12/31	x
Switch-back amort	3,419	Switch-back credit	15,000
Interest	2,775	Interest	1,050
	42,416		16,050+x

The minimum contribution required under 412 is one that results in a zero credit balance:

$42,416 = 16,050 + x$ $\qquad x = 26,366$

Since the minimum contribution under 412 exceeds the deductible limit under 404, the deductible limit becomes the same as the minimum. The reason this happened is that the five year amortization of the switch-back from the AMFSA has no direct effect on the calculation of the deductible limit under 404. The same effect occurs for funding waivers.

answer is E

Fall 1990 EA-2 Exam Solutions

Problem 16 - Page 1

Revenue Procedure 85-29 contains the rules for setting up a new amortization base when there is a change in cost method. Section 4.01 of Revenue Procedure 85-29 specifies that certain bases must be maintained regardless of the funding method that is used. These bases include waivers, shortfall gains and losses, switchback from AMFSA, and transition to satisfy the reasonable funding methods regulation.

The calculation of the normal cost must satisfy the formulas that are applicable to all reasonable funding methods (1.412(c)(3)-1):

PV Future Normal costs = PV Future Benefits - Actuarial Assets - O/S 412 amortization bases + credit balance

For cost methods with Unfunded Actuarial Liabilities, this can be restated as UAL = O/S 412 bases - credit balance. Under the Aggregate method, there will be no O/S 412 bases. You must determine the credit balance under the EAN method in order to do the Aggregate valuation. Under the EAN method, there were two bases, one for the IAL and one for the experience loss:

O/S IAL base = $250{,}000 \left(\ddot{a}_{\overline{24}|.07} / \ddot{a}_{\overline{30}|.07} \right) = 231{,}068$

O/S loss base = $5{,}000 \left(\ddot{a}_{\overline{14}|.07} / \ddot{a}_{\overline{15}|.07} \right) = 4{,}801$

Credit balance = O/S 412 bases - UAL = 231,068 + 4,801 - 180,000
= 55,869

AGG PVNC = PVFB - AAV - O/S bases + CB
= 500,000 - 70,000 - 0 + 55,869
= 485,869

PVE/E= 4,000,000 ÷ 500,000 = 8.0000

NC = 485,869 ÷ 8.0000 = 60,734 at 01/01/89

Problem 16 - Page 2

Minimum Funding Standards Account for 1989

Charges		Credits	
Normal cost	60,734	Credit balance	55,869
		Min contrib 12/31	x
Interest	4,251	Interest	3,911
	64,895		x+59,780

In this problem you should check the Full Funding Limitation, since you are given the Entry Age Normal accrued liability and the market value of assets. Based on the 12/82 proposed regulation, the Accumulated Funding Deficiency based on no contribution and no credit balance must be calculated. This is simply the charges of 64,895 in this problem.

Next the FFL is calculated under 412. The definition is similar to that under 404, except that the asset value is adjusted by the credit balance. Since you have no current liability figures, you only have to calculate the "old" 412 Full Funding Limitation.

"old" IRC 412 FFL = (1+i){ (NC+AL)-(lesser[MV,AAV]-CB) }
= 1.07 (20,000 + 250,000 - (70,000-55,869))
= 273,780

The 412 FFL credit is defined as the excess of the accumulated funding deficiency based on zero contribution and zero credit balance over the FFL. This excess is zero, so there is no Full Funding credit for 1989.

The minimum contribution required under IRC Section 412 is one that results in a zero credit balance:

64,895 = 59,780 + x x = 5,205

answer is C

Fall 1990 EA-2 Exam Solutions

Problem 17

Problem 17 was defective and it was thrown out. The problem tested the IRC Section 410(b) coverage rules.You were given data about the number of highly compensated and non-highly compensated employees, as well as the number who were participants. The question asked how many NHCE's must be covered under the 70% test in order for the plan to pass the test. The problem was thrown out due to errors in wording: covered versus benefiting.

Fall 1990 EA-2 Exam Solutions

Revised
07/06/00

Problem 18 - Page 1

For waivers granted after 1987, a 5 year amortization period should be used (use 15 years for waivers before 1988). One of the general conditions of the exam states that the interest rate used to calculate the amortization of a waiver should be based on the valuation interest rate.

Amortization of IAL = $120{,}000 \div \ddot{a}_{\overline{30}|.07} = 9{,}038$

Minimum Funding Standards Account for 1989

Charges		Credits	
Normal cost	15,000	Credit balance	-0-
IAL amort	9,038	Actual cont 12/31	-0-
Interest	1,682	Interest	-0-
	25,720		-0-

The amount of the waiver for 1989 is 25,720. The debit balance at 01/01/90 is offset by the credit under IRC Section 412(b)(3)(C). The same amount is set up as an amortization base and amortized over five years:

Amortization of waiver = $25{,}720 \div \ddot{a}_{\overline{5}|.07} = 5{,}863$

Since EAN is an individual cost method, you must calculate the experience G/L during 1989. The G/L base is calculated as the difference between the actual and the expected unfunded liabilities. The expected UAL at 01/01/90 is calculated using the standard formula:

$${}_eUAL_1 = (1+i)(UAL_0+NC_0) - (\text{Contribution}+\text{interest})$$
$${}_eUAL_1 = 1.07\ (\ 120{,}000 + 15{,}000\ ) - 0$$
$$= 144{,}450$$

The experience gain for 1989 is equal to the UAL minus the ${}_eUAL$:

UAL = 130,000 - 0 = 130,000
Gain = 144,450 - 130,000 = 14,450

You are told that the 1990 contribution is equal to the normal cost plus limit adjustments at 01/01/90:

$$NC + LA = 14{,}000 + (\ 120{,}000 - 14{,}450\ ) \div \ddot{a}_{\overline{10}|.07}$$
$$= 28{,}045$$

Problem 18 - Page 2

Amortization of gain = $14,450 \div \ddot{a}_{\overline{5}|.07} = 3,294$

Minimum Funding Standards Account for 1990

Charges		Credits	
Debit balance	25,720	Credit balance	-0-
Normal cost	14,000	412(b)(3)(C)	25,720
IAL amort	9,038	Gain amort	3,294
Waiver amort	5,863	01/01 contrib	28,045
Interest	3,823	Interest	3,994
	58,444		61,053

The credit balance at 12/31/90 is 61,053 - 58,444 = 2,609.

answer is C

An alternative approach is to calculate the credit balance as the difference between the UAL and the O/S 412 bases. You would calculate the experience gain as shown above. The waiver would be the difference between the O/S IAL 412 base and the UAL at 12/31/89:

12/31/89 O/S IAL base = $120,000 \left(\ddot{a}_{\overline{29}|.07} / \ddot{a}_{\overline{30}|.07} \right)$
= 118,730

Waiver = debit balance = 144,450 UAL - 118,730 OSB
= 25,720

12/31/90 O/S IAL base = $120,000 \left(\ddot{a}_{\overline{28}|.07} / \ddot{a}_{\overline{30}|.07} \right)$ = 117,370
= 117,370

12/31/90 O/S gain/waiver base = $(25,720 - 14,450) \times \left(\ddot{a}_{\overline{4}|.07} / \ddot{a}_{\overline{5}|.07} \right)$
= 9,310

12/31/90 UAL = 1.07 (130,000 + 14,000) - 1.07(28,045)
= 124,072

12/31/90 CB = O/S 412 bases - UAL
= 117,370 + 9,310 - 124,072 = 2,609

Fall 1990 EA-2 Exam Solutions

Problem 19

This is tricky Section 415 benefit calculation problem. The first step is to calculate the basic plan benefits. Next, the 415 limits must be applied. Since this participant was born between 1938 and 1954, the limits for a Social Security Retirement Age of 66 are used. The dollar maximum of 102,582 at age 66 has to be adjusted to reflect the plan's normal retirement age of 65:

102,582 (1-.06667) = 95,743

The overall 415 limit is defined as the lesser of 95,743 or 100% of 3 year FAE. The application of the 415 limits can not reduce the benefit below 10,000. The dollar maximum must be reduced pro-rata for less than 10 years of participation service. The other two limits would be reduced pro-rata for less than 10 years of service from hire.

Smith has 5 years of service at 01/01/90. Since the plan was set up at 01/01/90, Smith has zero years of participation at 01/01/90. The pro-rata reductions can't be less than 1/10, so Smith is treated as having one year of participation at both 01/01/90 and 01/01/91.

	Accrued Benefit as of 01/01/90	01/01/91
Years of service	5	6
2% * service * 200,000	20,000	24,000
10,000 minimum	10,000	10,000
Pro-rate for years of service < 10	5,000	6,000
100% 3 yr FAE	200,000	200,000
Pro-rate for years of service < 10	100,000	120,000
Years of participation	1	1
Dollar maximum	95,743	95,743
Pro-rate for years of participation < 10	9,574	9,574
Lesser of plan ben, or greater of (415 floor and lesser of 415 dollar or FAE3 maximums)	9,574	9,574

Since the accrued benefit is the same at 01/01/90 and 01/01/91, the benefit accrual for 1990 is zero.

answer is A

Fall 1990 EA-2 Exam Solutions

Revised
06/18/02

Problem 20

For problems involving the deductible limit you should use the following sequence of steps:

1. Calculate the normal cost plus limit adjustments with interest to the earlier of the end of the plan year or the end of the tax year.
2. Calculate the absolute minimum amount necessary to produce a non-negative credit balance in the Minimum Funding Standards Account. This amount should never be based on the Alternative MFSA. This amount may be increased by the amount of any "includible employer contribution."
3. Calculate the Full Funding Limitation under Section 404 with interest to the end of the plan year.
4. The maximum deductible limit is the greater of (1) and (2), but not greater than (3).
5. If the Unfunded Current Liability exceeds the final deductible limit and the plan has more than 100 participants, then the final deductible limit will be the UCL.

This question tests your knowledge of the handling of carryover contributions. The actuarial and market values of assets given in problems are those used under IRC Section 412. As specified in the regulations at 1.404(a)-14(d)(2)(i), the assets must be reduced by the amount of any non-deducted contributions.

In this problem, the 01/01/89 valuation is used to determine the tax deduction for the tax year ending 03/31/90. The AAV of 500,000 in this problem includes the 100,000 contribution for the 1988 plan year. Since only 40,000 was deducted for the tax year ending 03/31/89, 60,000 of the 100,000 contribution for 1988 has not yet been deducted.

```
IRC 404  AAV =    500,000 - 60,000
             =    440,000
IRC 404 PVNC =  1,800,000 - 440,000
             =  1,360,000
       PVE/E = 12,000,000 ÷ 900,000
             = 13.3333
IRC 404   NC =  1,360,000 ÷ 13.3333
             =    102,000
```

Normal cost + Limit adjustments = 1.08 (102,000) = 109,140

The Full Funding Limitation tests can be skipped since you have no Entry Age Normal valuation results to calculate the FFL. The deductible limit should be compared against the minimum funding requirement under IRC Section 412:

```
IRC 412 PVNC =  1,800,000 - 500,000 +10,000 = 1,310,000
IRC 412   NC =  1,310,000 ÷ 13.3333          =   98,250
IRC 412  min =  1.07( 98,250 - 10,000 )      =   94,428
```

answer is D

Fall 1990 EA-2 Exam Solutions

Problem 21

I. FALSE

If an enrolled actuary has a conflict of interest, they can perform actuarial services as long as they notify the appropriate parties. In working with a collectively bargained plan, the collective bargaining representative would have to be notified of the conflict of interest. This is covered under ERISA regulations governing standards of performance of actuarial services at Section 901.20(d).

II. TRUE

An enrolled actuary should notify the IRS, DOL or PBGC in writing when they learn that a document has not been filed. This is covered under ERISA regulations governing standards of performance of actuarial services at Section 901.20(h).

III. TRUE

An actuary may be disenrolled if they engage in "conduct evidencing fraud, dishonesty, or breach of trust". This includes conviction of criminal offense, knowingly filing false documents, knowingly making false representations, etc. This is covered under ERISA regulations governing grounds for suspension or termination of enrollment at Section 901.31(c).

Items II and III are true.

answer is C

Fall 1990 EA-2 Exam Solutions

Problem 22

The problem states that the DB plan benefit will be reduced if the Section 415 limits are exceeded. You are given the DC fraction under Section 415(e)(3) as .38. The maximum DB plan fraction equals one minus the DC fraction, or .62. You can "back into" the projected benefit under the DB plan that will produce the DB fraction of .62.

You should be wary of a calculation that shows a DB fraction that exceeds 80%. This is not possible, since the largest possible DB fraction under Section 415(e)(2) is 1/1.25 = .8000, which results from a projected benefit equal to the DB plan dollar maximum. If the 100% FAE3 limit applied, then the DB fraction is 1/1.40 = .7143 .

Now you must calculate the DB plan fraction in order to determine the maximum projected benefit for valuation purposes. Smith is age 65 at 01/01/91. Smith's total service at retirement is nine years based on the 01/01/82 date of hire. With an effective date of 01/01/85, Smith's participation service under this plan will be six years at retirement. The 415 limits have to be reduced for service (or participation) less than ten years.

3 year final average pay = 200,000

Projected plan benefit prior to limitations = .5 (200,000) = 100,000

100% FAE3 Section 415 limit reduced for service = 200,000(9/10) = 180,000

Social Security Retirement Age = 65 since born prior to 1938
Section 415 dollar limit during 1991 = 102,582 at age 65
Section 415 dollar limit reduced for participation = 102,582(6/10) = 61,549
Section 415 dollar limit reduced for service = 102,582(9/10) = 92,324

PB = final projected benefit
DB fraction = 62% = PB ÷ [lesser of 1.25(92,324) or 1.40(180,000)]
PB = 62% (lesser of 115,405 or 252,000)
= 71,551

This benefit under 415(e) does not satisfy the 415 limits for a DB plan without a DC plan! The 61,549 limit becomes the final maximum benefit.

answer is C

Fall 1990 EA-2 Exam Solutions

Problem 23

To calculate the required quarterly contribution, you must first calculate the required annual payment (RAP). This is the lesser of last year's minimum required contribution or 90% of this year's. These numbers are both interest adjusted to the first day of this plan year, and they both would not reflect any credit balance.

1989 "minimum requirement" at 12/31/89 = $1.07(45,000+40,000) = 90,950$

1990 "minimum requirement" at 01/01/90 = $100,000 = 60,000 + 40,000$
RAP = lesser of 1989 or 90% of 1990 = $90,000$

The required quarterly contribution is based on the applicable percentage multiplied by the RAP. The applicable percentage is 6.25% in 1989, 12.50% in 1990, 18.75% in 1991, and 25% in 1992. The initial calculation of the required quarterly is $.125(90,000) = 11,250$.

You get to take credit for the credit balance at 01/01/90 as if it was a payment toward the required quarterly contribution. The credit balance at 01/01/90 is 105,000 - 90,950 = 14,050. There is an overpayment at 04/15/90 based on the accumulated credit balance with interest as well as the additional contribution of 7,500:

Amount avail at 04/15/90 = $14,050(1.07)^{3.5/12} + 7,500 = 21,830$

Overpayment at 04/15/90 = 21,838 - 11,250 = 10,580

Amount avail at 07/15/90 = $10,580(1.07)^{3/12} = 10,760$

Required additional payment = 11,250 - 10,760 = 490

answer is A

Fall 1990 EA-2 Exam Solutions

Revised
06/18/02

Problem 24

For problems involving the deductible limit you should use the following sequence of steps:

1. Calculate the normal cost plus limit adjustments with interest to the earlier of the end of the plan year or the end of the tax year.
2. Calculate the absolute minimum amount necessary to produce a non-negative credit balance in the Minimum Funding Standards Account. This amount should never be based on the Alternative MFSA. This amount may be increased by the amount of any "includible employer contribution."
3. Calculate the Full Funding Limitation under Section 404 with interest to the end of the plan year.
4. The maximum deductible limit is the greater of (1) and (2), but not greater than (3).
5. If the Unfunded Current Liability exceeds the final deductible limit and the plan has more than 100 participants, then the final deductible limit will be the UCL.

Since you have no information about the MFSA, the solution of this problem is simplified. Under the Aggregate method, there are no limit adjustments, so the NC+LA equals the end of year normal cost of 250,000.

Revenue Ruling 82-125 clarifies the handling of the Full Funding Limitation for the deductible limit when carryover contributions are present. The Full Funding Limitation is always adjusted with interest to the end of the year. Since you are given end of year valuation results, there are no interest adjustments in this problem.

Any carryover contribution should not receive interest for the FFL, and it should be subtracted from the assets (excluding the carryover) adjusted with interest to the end of the year.

old FFL = (1+i)(AL + NC - lesser MVA,AAV) + carryover
= 900,000 - lesser(575,000 and 525,000) + 100,000
= 475,000

new FFL = 1.08 (1.5 [12/31 current liab]/1.08 - lesser MVA,AAV) + carry
= 1.5(800,000) - lesser(575,000 and 525,000) + 100,000
= 775,000

It appears that the FFL does not apply in this problem. You need to look at the information given on the Current Liability at 12/31/89 since this plan has more than 100 employees.

UCL at 12/31/89 = 800,000 - 575,000 + 100,000
= 325,000

The final deductible contribution equals the greater of 325,000 and the lesser of 475,000 or 250,000 = 325,000.

answer is C

Problem 25 - Page 1

This is a typical PBGC guaranteed benefits question. It tests your knowledge of the five year phase-in of guaranteed benefits, and the 30 year phase-in for substantial owners. Both participants are fully vested, which simplifies the guaranteed benefit calculation. Guaranteed benefits are based on the vested benefits of the plan participants.

One question you need to answer is whether either participant is in Priority Category 3. If so, then a smaller portion of their benefits would be in Priority Category 4. The definition of PC3 is that it includes participants who could have retired three years before DOPT based on the early retirement eligibility at the same date. The amount of PC3 benefits are based on the plan in effect five years before DOPT.

At 12/31/87 we have	BROWN	SMITH
Age at DOPT-3	63	67
Past service at DOPT-3	27	9

Neither of the participants satisfied the retirement eligibility of age 65 with 10 years of service that defines Priority Category 3.

The change in plan benefits at 07/01/87 and 01/01/89 are subject to phase-ins at the DOPT of 12/31/90. The change in normal retirement eligibility at 01/01/89 could affect the calculation of guaranteed benefits. However, Smith's NRA of age 68 was unchanged by the plan amendment. Since Brown is over age 65, the amendment has no effect on the age benefits are paid (age 66).

The 07/01/87 benefits have been in effect for three full years at DOPT. Brown is a substantial owner who is subject to the 30 year phase in rules. Smith is subject to the 5 year phase in rules. For the 30 year phase in, the original plan has been in effect for 15 full years, from 01/01/76 to 01/01/91.

In calculating the guaranteed benefit, remember that changes in vesting schedule, normal retirement age, and normal form of annuity payment are all considered as changes in benefit amount that are subject to the phase in rules.

Problem 25 - Page 2

	BROWN	SMITH
Past service at DOPT	30	10
Benefit - 01/01/76 plan	30(20) = 600/mo	10(20) 200/mo
Benefit - 07/01/87 plan	30(30) = 900/mo	10(30) 300/mo
Guaranteeable benefit increase	300/mo	100/mo
Guaranteed Portion - original	600/mo * (15/30) = 300/mo	200/mo
Guaranteed Portion - increase	300/mo * (3/30) = 30/mo	greater of \$60 or 60%*100/mo = 60/mo
Total guaranteed benefit	330/mo	260/mo

The total monthly guaranteed benefit is 330 + 260 = 590. Note that the phase-in calculations for both employees are based on complete years that the benefits have been in effect.

answer is D

Problem 26

Section 404(a)(7)(A) of the IRC states the deductible limitation for combinations of DB and DC plans. The limit is the greater of 25% of taxable compensation, or the minimum contribution requirement of the DB plans required under Section 412. Section 4972 of the IRC imposes a 10% excise tax on contributions exceeding the deductible limitation.

For a plan funded under the Aggregate method with a zero credit balance, the normal cost calculated payable at the end of the year is the minimum required contribution at that date, which is 275,000. The deductible limit is 275,000, which is the greater of 25%(1,000,000-25,000) or the 275,000 minimum. The taxable compensation is calculated as the total compensation of 1,000,000 less the 25,000 employee pre-tax contributions.

The total contribution paid for the year is 400,000, which equals 300,000 for the DB plan plus 100,000 for the 401(k) plan. Note that the employee pre-tax elective contributions are counted as employer contributions. The contribution subject to excise tax is the excess of 400,000 over the deductible limit of 275,000, or 125,000.

answer is C

Fall 1990 EA-2 Exam Solutions

Problem 27

This problem tests your knowledge of the ERISA Section 4044 asset allocation priority categories. In general, PC3 includes employees who were retired, or who could have retired three years before plan termination. The benefit amount is based on the plan provisions in effect in the five years preceding plan termination that produce the lowest benefit level. Benefits in Priority Category 3 are not subject to any phase-ins, and they can exceed the Maximum Guaranteed Benefit amount.

Smith was age 55 at 01/01/87, which is the date of retirement, as well as DOPT-3. The retirement benefit was based on the plan provisions at DOPT-5, so it excludes the 15% increase:

Service at 01/01/87:	12 years
Service at age 65:	22 years
Accrued benefit at 01/01/87:	8,182 = 50%(30,000)(12/22)
Early retirement benefit:	3,273 = 8,182(1-6%(10))
Spouse's death benefit:	1,636 = 50%(3,273)
	= 136/mo

answer is B

Fall 1990 EA-2 Exam Solutions

Problem 28

For any plan, the Top Heavy determination date is the last day of the preceding plan year. An exception to this is first plan year, when the determination date is the last day of the first plan year.

It is necessary to add the present value of accrued benefits and the account balances as of that date for all participants and the key employees. These amounts should include distributions within the five years preceding the determination date. The amounts should exclude values for terminated employees who have not been employed in the last 5 years.

If the ratio of key employee values to total values exceeds 60%, the plan is Top Heavy. If the ratio exceeds 90%, the plan is super Top Heavy.

The three employees Green, White, and Black are identified as non-key employees. Blue was a key employee, but should be excluded because they have not been employed for the last five years. Gray and Brown are both key employees.

The account balances for the key employees are

150,000 + 60,000 (Gray) + 40,000 + 30,000 (Brown) = 280,000

The account balances for the non-key employees are

60,000 + 25,000 (Green) + 45,000 + 15,000 (White) +
85,000 + 45,000 (Black) = 275,000

The top-heavy ratio is 280 / (280+275) = .505

answer is A

Fall 1990 EA-2 Exam Solutions

Problem 29

The main point of the problem is that the 412 amortization bases are not eliminated at 01/01/89. The reason is that the old FFL did not apply during 1988. The first step in the problem is to calculate the ten year amortization of the FFL credit, which creates a new 412 amortization base.

01/01/89 FFL amortization = $33,440 \div \ddot{a}_{\overline{10}|.08} = 4,614$

Minimum Funding Standards Account for 1989

Charges		Credits	
Normal cost	55,000	Credit balance	-0-
Waiver amort	3,000	Amortization	5,000
Other amort	20,000		
FFL amort	4,614		
Interest	6,609	Interest	400
	89,224		5,400

Based on the 12/82 proposed regulation, the Accumulated Funding Deficiency based on no contribution and no credit balance must be calculated. This equals the charges of 89,224 less the amortization credits plus interest of 5,400. The resulting AFD is 83,824.

Next the FFL is calculated under 412. There are two definitions. The "old" FFL is the pre-OBRA '87 definition, and the "new" FFL is the OBRA '87 current liability definition. Since this is an aggregate type cost method, the FFL calculations are based on the Entry Age normal valuation.

"old" IRC 412 FFL = (1+i)(NC+AL)-(lesser[MV,AAV]-CB)
= 1.08 (45,000 + 680,000 - (700,000-0))
= 27,000

"new" IRC 412 FFL = (1+i)(1.5[CLNC+CLAL])-(1+i)(lesser[MV,AAV]-CB)
= 1.5(540,000) - (1.08)(700,000-0)
= 54,000

Notice the tricky calculation of the "new" FFL that is necessary since you are given the current liability and asset value at year end! The 412 FFL credit is defined as the excess of the accumulated funding deficiency based on zero contribution and zero credit balance over the FFL. This excess is 83,824 - 27,000 = 56,824.

answer is E

Fall 1990 EA-2 Exam Solutions

Problem 30

The Deficit Reduction Contribution (DRC) is the sum of the Unfunded Old Liability Amount (UOLA) and the Unfunded New Liability Amount (UNLA). The UOLA is the 18 year amortization of the 1-1-88 Unfunded Current Liability, starting at 1-1-89:

$110{,}000 \div \ddot{a}_{\overline{18}|.09} = 11{,}526$

The UNLA is a percentage of the UNL, based on the Funded current liability percentage:

FCL% = (AAV-CB)÷(Current Liability)
UNLA = UNL * (30%-25%[FCL%-35%])

The Unfunded New Liability is the excess of the Unfunded current liability at 1-1-89, less the unamortized portion of the unfunded old liability, less any Unpredictable Contingent Event Liability:

UNL = 170,000 - 110,000 = 60,000

FCL% = (510,000-0)÷(510,000+170,000) = 75.0%

UNLA = 60,000 * (.30 - .25[.750-.350])
= 60,000 * .20
= 12,000

NOTE: You are given this 20% figure for a FCL% = 75%

Finally, the DRC is 11,526 + 12,000 = 23,526 at 1-1-89.

answer is B

Problem 31 - Page 1

For problems involving the deductible limit you should use the following sequence of steps:

1. Calculate the normal cost plus limit adjustments with interest to the earlier of the end of the plan year or the end of the tax year.
2. Calculate the absolute minimum amount necessary to produce a non-negative credit balance in the Minimum Funding Standards Account. This amount should never be based on the Alternative MFSA. This amount may be increased by the amount of any "includible employer contribution."
3. Calculate the Full Funding Limitation under Section 404 with interest to the end of the plan year.
4. The maximum deductible limit is the greater of (1) and (2), but not greater than (3).
5. If the Unfunded Current Liability exceeds the final deductible limit and the plan has more than 100 participants, then the final deductible limit will be the UCL.

Since EAN is an individual cost method, you must calculate the experience G/L during 1989. The G/L base is calculated as the difference between the actual and the expected unfunded liabilities. These calculations are based on Revenue Ruling 81-213, which covers determinations of experience gains and losses. By definition, the UAL is the excess, **if any**, of the Accrued Liability over the actuarial value of assets.

The expected UAL at 01/01/90 is calculated using the standard formula:

$$ {}_eUAL_1 = (1+i)(UAL_0+NC_0) - (\text{Contribution+interest}) $$
$$ {}_eUAL_1 = 1.07\ (\ 10{,}000 + 15{,}000\ ) - 30{,}000 $$
$$ = -3{,}250 $$

The fact that the expected UAL is less than zero should alert you that something unusual has happened. The contribution for 1989 was sufficient to wipe out the entire UAL!

The experience gain for 1989 is equal to the UAL minus the ${}_eUAL$:

UAL = 123,050 - 126,300 = -3,250 => treat as zero
LOSS = 3,250

You may not be comfortable with the fact that we have limited the UAL to zero, and we allowed the expected UAL to be negative. See the discussion following the derivation of the numerical answer for a "proof".

Section 404 deductible limit calculation for 1989

One easy way to miss the problem is to not look at the contribution limits for 1989. You should check the FFL for 1989 to see if the 30,000 exceeded the deductible limit.

Problem 31 - Page 2

01/01/89 Normal cost plus Limit adjustments

$= 1.07 \left(15{,}000 + 50{,}000 \div \ddot{a}_{\overline{10}|.07} \right)$

$= 1.07 \left(15{,}000 + 6{,}653 \right)$

$= 23{,}169$

Revenue Ruling 82-125 clarifies the handling of the Full Funding Limitation for the deductible limit when carryover contributions are present. The Full Funding Limitation is always adjusted with interest to the end of the year. Any carryover contribution should not receive interest for the FFL, and it should be subtracted from the assets (excluding the carryover) adjusted with interest to the end of the year.

You are not given the current liability results, so you only have to calculate the pre-OBRA '87 FFL definition:

01/01/89 404 FFL = (1+i)(NC + AL - lesser MVA,AAV) + carryover
= 1.07 (15,000 + 100,000 - 85,000)
= 32,100

Section 404 deductible limit calculation for 1990

The 404 FFL did not apply at 01/01/89, so the deductible limit for 1989 was 23,169. The resulting non-deductible contribution at 01/01/90 is 30,000 - 23,169 = 6,831.

01/01/90 Normal cost plus Limit adjustments

$= 1.07 \left[15{,}000 + \left(50{,}000 + 3{,}250 \right) \div \ddot{a}_{\overline{10}|.07} \right]$

$= 1.07 \left(15{,}000 + 7{,}086 \right) = 23{,}632$

As you will see shortly, this is not really correct! However, most people worked the problem this way on the exam, and got the right answer, too.

01/01/90 404 FFL = (1+i)(NC + AL - lesser MVA,AAV) + carryover
= 1.07 (15,000 + 123,050 - 125,000) + 6,831
= 20,795

The final step normally is to look at the minimum funding requirement under Section 412. In this problem that is unnecessary. Since the 404 FFL is less than the NC+LA, the 412 minimum can not produce a higher deductible limit. In other words, you take the lesser of the 404 FFL and the greater of (NC+LA, or the 412 minimum).

Based on this incorrect method of solution, the deductible limit is 20,795, which is answer D.

Problem 31 - Page 3

Section 404 deductible limit calculation for 1990 - CORRECT

At 01/01/90, the 404 UAL should equal the 412 UAL plus any non-deducted contributions. The 404 UAL also equals the outstanding ten year amortization bases:

404 UAL = 412 UAL + NDC
= 0 + 6,831
= 3,581 O/S 404 base + 3,250 LOSS

You can verify that 3,581 is the outstanding 404 base that corresponds to the UAL of 10,000 at 01/01/89. You should use the complex formula involving non-deducted contributions in the 1.404(a)-14 regulation for writing down the ten year amortization bases.

The key point is that the outstanding 404 amortization base of 3,581 at 01/01/90 is less than the ten year amortization payment of 6,653 calculated on the original 50,000 base. The definition of the limit adjustment is that it is the lesser of the ten year amortization payment, or the outstanding amount of the base.

At 01/01/90, the Normal cost plus Limit adjustments equals

$= 1.07 [15,000 + \text{lesser of } (6,653 \text{ or } 3,581) + 3,250 \div \ddot{a}_{\overline{10}|.07}]$

$= 1.07 (15,000 + 3,581 + 433) = 20,345$

01/01/90 404 FFL = (1+i)(NC + AL - lesser MVA,AAV) + carryover
= 1.07 (15,000 + 123,050 - 125,000) + 6,831
= 20,795

The 404 FFL does not apply in this problem, since it is more than the NC+LA. The final step normally is to look at the minimum funding requirement under Section 412. Since the credit balance is so large at 01/01/90, the minimum funding requirement is zero. The final deductible limit is the NC+LA of 20,345.

answer is D

You can validate that there should be a loss base of 3,250 at 01/01/89 by checking the equation of balance:

01/01/89 UAL = O/S 412 bases - CB

$10,000 = \ddot{a}_{\overline{26}|.07}(50,000 \div \ddot{a}_{\overline{30}|.07}) - CB$

$50,000 \div \ddot{a}_{\overline{30}|.07} = 3,766$

CB = 12.6536 (3,766) - 10,000
= 37,650

Problem 31 - Page 4

12/31/89 eUAL = O/S 412 bases (excl G/L) - CB
01/01/90 UAL = O/S 412 bases (incl G/L) - CB

$$0 = \ddot{a}_{\overline{25}|.07}(50{,}000 \div \ddot{a}_{\overline{30}|.07}) + \text{G/L base} - \text{CB}$$
$$= 46{,}956 + \text{G/L base} - \text{CB}$$

Now you must set up the MFSA for 1989 to determine the credit balance:

Minimum Funding Standards Account for 1989

Charges		Credits	
Normal cost	15,000	Credit balance	37,650
IAL amort	3,766	Contrib 12/31	30,000
Interest	1,314	Interest	2,636
	20,080		70,286

The credit balance at 12/31/89 is 70,286 - 20,080, or 50,206.

0 = 46,956 + G/L base - 50,206
G/L base = 50,206 - 46,956 = 3,250

In order to meet the equation of balance, the loss base must be 3,250. This is based on the actual UAL equal to zero as defined in RR 81-213. This verifies that the eUAL can become negative, even though the actual UAL can not.

Fall 1990 EA-2 Exam Solutions

Problem 32

This is an unusual PBGC guaranteed benefits question. In general, benefit increases within the 60 months preceding DOPT are not guaranteed. For a multiemployer plan that is "underfunded", the PBGC guarantees a $5 per month benefit accrual rate plus 65% of the next $15 per month of benefit accrual.

Since this plan has always paid the normal cost plus interest on the UAL, it presumably is not underfunded. For a multiemployer plan that is not "underfunded", the PBGC guarantees a $5 per month benefit accrual rate plus 75% of the next $15 per month of benefit accrual. For this plan that produces a guaranteed benefit based on $5.00+.75(10)= $12.50 per month.

(1)	(2)	(3)	(4)	(5)=(1)*(2)*(3)*(4)
Number of Participants	Years of Service	Benefit Rate	Present Value Factor	P.V. of Benefits
5	30	12.50	50	93,750
15	20	12.50	35	131,250
				225,000

answer is B