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FALL 1992 EA-2 EXAM SOLUTIONS

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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, 1992.

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:

01/09/03 Corrected problem 20, page 2
12/17/02 Corrected problem 18, page 1
07/06/00 Corrected problem 11, page 3
06/16/99 Corrected problem 18, page 2
09/19/97 Corrected problem 31, page 1
09/10/97 Corrected problem 15, page 1
08/29/96 Corrected problem 12, page 2
11/25/95 Corrected problem 11, page 2
11/25/95 Corrected problem 22
10/22/94 Corrected problem 2, page 1
10/22/94 Eliminated reference to ARA under Agg method for problems 6, 18
10/22/94 Corrected problems 10, 11, 26, and 29
10/28/93 Revised text in solution for problem 12

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Problem 1

I. FALSE

In the reasonable funding methods regulation at 1.412(c)(3)-1(c)(3), the general rule requires you to include all participants in the valuation population, as well as former participants who terminated service with the employer. Paragraph (iii) has an exclusion for "rule of parity" cases, which allows you to exclude "former participants who have terminated service with the employer without vested benefits and whose service might be taken into account in future years because the 'rule of parity' ...". The exclusion of these employees must be reasonable based on the plan's past experience.

II. FALSE

In the reasonable funding methods regulation at 1.412(c)(3)-1(c)(3), paragraph (ii) allows you to exclude from the valuation population current plan participants who have not yet satisfied the minimum age and service requirements under IRC Section 410.

III. FALSE

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. You must NOT include allowance for future participants who have not yet been hired.

All three items are false.

answer is A

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Problem 2 - Page 1

UC is an individual cost method, and you should calculate the experience G/L each year. The expected UAL at 12/31/91 can be calculated based on what we expect the outstanding section 404 bases to be. If the maximum deductible limit is paid at the end of each year, the 404 bases will decrease based on a ten year interest amortization:

$$\begin{aligned} 12/31/91 \text{ } _e\text{UAL} &= 300,000 (\ddot{a}_{\overline{91}.08} \div \ddot{a}_{\overline{101}.08}) \\ &= 279,291 \end{aligned}$$

The experience loss for 1991 is equal to the UAL minus the $_e\text{UAL}$:

$$1991 \text{ Loss} = 290,000 - 279,291 = 10,709$$

The assumption change at 01/01/92 creates a new charge base equal to 315,000 minus 290,000 or 25,000.

The most direct method of solution is to calculate the credit balance at 12/31/91 as the difference between the maximum and minimum contributions:

$$1991 \text{ Maximum} = 1.08 (\text{NC} + 300,000 \div \ddot{a}_{\overline{101}.08})$$

$$1991 \text{ Minimum} = 1.08 (\text{NC} + 300,000 \div \ddot{a}_{\overline{301}.08})$$

$$\begin{aligned} 12/31/91 \text{ CB} &= 1.08 * (300,000 \div \ddot{a}_{\overline{101}.08} - 300,000 \div \ddot{a}_{\overline{301}.08}) \\ &= 18,061 \end{aligned}$$

To calculate the credit balance at 12/31/92, you must include the effect of the amortization for the loss. The assumption change can be ignored, since it has the same 10 year amortization period for both the maximum and the minimum:

$$1992 \text{ Maximum} = 1.08 [\text{NC} + (300,000 + 10,709) \div \ddot{a}_{\overline{101}.08}]$$

$$1992 \text{ Minimum} = 1.08 (\text{NC} + 300,000 \div \ddot{a}_{\overline{301}.08} + 10,709 \div \ddot{a}_{\overline{51}.08})$$

$$\begin{aligned} 12/31/92 \text{ CB} &= 1.08 * (300,000 \div \ddot{a}_{\overline{101}.08} - 300,000 \div \ddot{a}_{\overline{301}.08}) \\ &\quad + 1.08 * (10,709 \div \ddot{a}_{\overline{101}.08} - 10,709 \div \ddot{a}_{\overline{51}.08}) \\ &\quad + 1.08 * 18,061 \\ &= 36,481 \end{aligned}$$

answer is A

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Problem 2 - Page 2

The alternative is to derive the credit balance, using the equation of balance. This involves a bit more arithmetic than the solution above.

$$\text{UAL} = \text{O/S 412 bases} - \text{CB} - \text{ARA}$$

$$\text{CB} = \text{O/S 412 bases} - \text{UAL} - \text{ARA}$$

Based on the general conditions for the exam, the ARA equals zero.

$$\begin{aligned} 12/31/92 \text{ O/S bases} &= 300,000 * (\ddot{a}_{\overline{28}|.08} \div \ddot{a}_{\overline{30}|.08}) \\ &+ 25,000 * (\ddot{a}_{\overline{9}|.08} \div \ddot{a}_{\overline{10}|.08}) \\ &+ 10,709 * (\ddot{a}_{\overline{4}|.08} \div \ddot{a}_{\overline{5}|.08}) \\ &= 326,650 = 294,492 + 23,274 + 8,884 \end{aligned}$$

$$\begin{aligned} 12/31/92 \text{ UAL} &= 300,000 * (\ddot{a}_{\overline{8}|.08} \div \ddot{a}_{\overline{10}|.08}) \\ &+ 35,709 * (\ddot{a}_{\overline{9}|.08} \div \ddot{a}_{\overline{10}|.08}) \\ &= 290,170 = 256,926 + 33,244 \end{aligned}$$

$$12/31/92 \text{ CB} = 326,650 - 290,170 = 36,480 \quad (\text{close enough})$$

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Problem 3

This is a tricky PBGC guaranteed benefits question. It tests your knowledge of the five year phase-in of guaranteed benefits, and the maximum guaranteeable benefit limit. Guaranteed benefits are based on the vested benefits of the plan participants. 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.

Normalization is the process of converting benefits available under earlier sets of plan provisions to equivalent benefit amounts based on the plan provisions in effect at date of plan termination. This is a necessary step, otherwise you would be comparing apples and oranges. It is not possible to compare a five year certain and life benefit directly to a life annuity form. If the benefits are converted to the same form of benefit payment, then you can calculate the increase in value directly.

The change in plan benefits at 07/01/89 is subject to phase-ins at the DOPT of 12/31/92. The new benefits have been in effect for three full years at DOPT. To solve this problem, you must convert both the 1/1/76 benefit and the maximum guaranteed benefit limit from a life annuity basis to a 5 year guaranteed basis. The conversion is done using the PBGC factor given:

	SMITH (5 yr guarantee)	SMITH (life annuity)
Past service at DOPT	25	
Maximum guaranteed benefit limit	$2,352.27 \times .975$ $= 2,293/\text{mo}$	$2,352.27/\text{mo}$
Benefit - 01/01/76 plan	$2,000 \times .975$ $= 1,950/\text{mo}$	25×80 $= 2,000/\text{mo}$
Benefit - 07/01/89 plan (limited to maximum)	25×95 $= 2,375/\text{mo}$ $2,293$	
Guaranteeable benefit increase	$2,293 - 1,950$ $= 343/\text{mo}$	
Guaranteed Portion - increase (can not exceed total increase)	$\text{greater of } \$60 \text{ or } 60\% \times 343/\text{mo}$ $= 206/\text{mo}$	
Total guaranteed benefit	$1,950 + 206$ $= 2,156/\text{mo}$	

answer is B

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Problem 4 - Page 1

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.

One trick to this problem is that there is no penalty for late quarterly contributions for 1991. The reason is that there are no required quarterly installments for the first plan year that Section 412 applies.

$$\begin{aligned} 12/31/91 \text{ "minimum requirement"} &= 1.08 * (51,000 + 200,000 \div \ddot{s}_{30|1.08}) \\ &= 72,845 \end{aligned}$$

$$\begin{aligned} 01/01/92 \text{ "minimum requirement"} &= 55,000 + 200,000 \div \ddot{s}_{30|1.08}) \\ &= 71,450 \end{aligned}$$

$$\text{RAP} = \text{lesser of 1991 or 90\% of 1992} = 64,305$$

The required quarterly installment is based on the applicable percentage multiplied by the RAP. This equals $.25(64,305) = 16,076$.

You would get to take credit for any credit balance at 01/01/91 as if it was a payment toward the required quarterly contribution. Since you have no credit balance, there is an underpayment starting at 04/15/92, which is the due date of the first required quarterly installment:

DATE	REQ'D QTRLY	Amount Available	Overpayment (Underpayment)
04/15/92	16,076	-0-	(16,076)
07/15/92	16,076	-0-	(32,152)
10/15/92	16,076	-0-	(48,229)
01/15/93	16,076	-0-	(64,305)
01/31/93		77,166+penalty	-0-

The definition of the interest penalty is that it is interest on the amount of the underpayment for the period of the underpayment. IRS Notice 89-52 defines exactly how to calculate the penalty. You reflect interest at 175% of the FMR, and subtract the interest at the valuation rate that would be earned on the contribution (if it was paid to the MFSA) up to the end of the plan year.

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Problem 4 - Page 2

Amount of the first underpayment at 04/15/92 is 16,076

Period of the underpayment is 9½ months

Interest earned in MFSA to 12/31/92 for 8½ months

Calculated interest penalty is

$$16,076 [(1.1193)^{9.5/12} - (1.08)^{8.5/12}]$$

If you follow this pattern for all four payments, this is the expression for the total interest penalty:

$$\begin{aligned} 16,076 [& (1.1193)^{9.5/12} - (1.08)^{8.5/12} \\ & + (1.1193)^{6.5/12} - (1.08)^{5.5/12} \\ & + (1.1193)^{3.5/12} - (1.08)^{2.5/12} \\ & + (1.1193)^{.5/12} - (1.08)^0] \end{aligned}$$

$$1,387 = 16076 (.0373 + .0270 + .0173 + .0047)$$

Note that the last payment occurs after the end of the plan year, and earns no interest in the Minimum Funding Standards Account. The penalty interest continues to accrue beyond the end of the plan year.

answer is B

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Problem 5 - 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. The tests are designed to prevent plans which are heavily back-loaded. There is nothing wrong with a plan that has higher rates of benefit accrual for the early years of service.

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.

In general, none of the formulas will satisfy the pro-rata rule. The reason is that the plan's accrued benefit must be defined based on the pro-rata rule in order to pass! The 133 1/3% rule is very easy to test, so the only work you must do is for the 3% rule.

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

The projected NRB for a participant who enters before age 35 is $1\%(10) + 1.5\%(10)$ which equals 25%. The benefits should accrue at the rate of .03(25%) or .75% per year.

This formula satisfies the 3% rule.

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Problem 5 - Page 2

II. 1.0% for first 15 years, 1.5% for next 15 years, 0% thereafter

The projected NRB for a participant who enters before age 35 is $1\%(15) + 1.5\%(15)$ which equals 37.5%. The benefits should accrue at the rate of .03 (37.5%) or 1.125% per year. The actual accrued benefit after one year of service is only 1% of pay.

This formula does not satisfy the 3% rule.

This formula does not satisfy the $133 \frac{1}{3}\%$ rule, since 1.5% is more than $1.333 * 1.0\% = 13.3\%$.

This formula does not satisfy the fractional rule.

III. 0.75% for first 20 years, 1.0% for next 20 years, 0% thereafter

This formula does not satisfy the 3% rule, since the benefits accrue over more than $33 \frac{1}{3}$ years. The accrued benefit must be 100% of the projected benefit, since $3\%(33.333) = 100\%$.

This formula satisfies the $133 \frac{1}{3}\%$ rule, since 1.0% is not greater than $1.333 * 0.75\% = 1.0\%$.

Formulas I and III satisfy the minimum benefit accrual rules.

answer is B

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Problem 6 - Page 1

For waivers granted prior to 1988, a 15 year amortization period should be used (use 5 years for waivers after 1987). 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.

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

$$\text{PV Fut Normal costs} = \text{PV Future Benefits} - \text{Actuarial Assets} \\ - \text{O/S 412 amortization bases} + \text{credit balance}$$

For cost methods with Unfunded Actuarial Liabilities, the comparable relationship is $\text{UAL} = \text{O/S 412 bases} - \text{credit balance} - \text{ARA}$. Under the Aggregate method, there would normally be no O/S 412 bases. In this problem, you do have a waiver base to amortize in the MFSA.

$$\begin{aligned} 01/01/91 \text{ PVNC} &= \text{PVB} - \text{AAV} - (\text{O/S 412 bases} - \text{CB}) \\ &= 250,000 - 100,000 - (10,000 + 3,000) \\ &= 137,000 \end{aligned}$$

$$\begin{aligned} \text{PVE/E} &= 750,000 \div 200,000 = 3.7500 \\ \text{NC} &= 137,000 \div 3.7500 = 36,533 \quad \text{at } 01/01/91 \end{aligned}$$

The next step in the solution is to set up the MFSA for 1991. The waiver base was amortized over 15 years from 01/01/85, and there are 9 years left at 01/01/91.

$$\text{Waiver amort} = 10,000 \div \ddot{a}_{\overline{9}|.08} = 1,482$$

Minimum Funding Standards Account for 1991

<u>Charges</u>		<u>Credits</u>	
Debit balance	3,000	Credit balance	-0-
Normal cost	36,533		
Waiver amort	1,482	Actual cont 12/31	32,000
Interest	3,281	Interest	-0-
	<hr/>		<hr/>
	44,296		32,000

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Problem 6 - Page 2

The debit balance at 12/31/91 is 12,296. This is a bit unusual, since there was also a debit balance at the beginning of the year. You should not assume that a waiver is granted for either one of these deficiencies.

Minimum Funding Standards Account for 1992

<u>Charges</u>		<u>Credits</u>	
Debit balance	12,296	Credit balance	-0-
Normal cost	36,533		
Waiver amort	1,482	Min cont 12/31	x
Interest	4,025	Interest	-0-
	<hr/>		<hr/>
	54,337		x

The minimum contribution required under 412 is 54,337.

answer is E

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Problem 7

This problem is an easy one, since there is really nothing hidden. The only tricks to the problem are that you must pro-rate the additional 412(1) funding charge, and you must adjust the value to the end of the year with the current liability interest rate.

The MFSA charges should be increased by the Unpredictable Contingent Event amount plus the excess, if any, of the DRC over the MFSA charges and credits specified in Section 412(1):

$$18,000 + (80,000 - 15,000) = 83,000$$

The 412(1) additional funding charge must be pro-rated for plans with between 100 and 150 lives. The calculation is based on the largest number of participants on any day of the prior plan year. The pro-rata reduction equals 2% times the number of participants in excess of 100:

$$\begin{aligned} \text{Additional 412(1) funding charge} &= 2\% * (145-100) * 83,000 \\ &= .90 * 83,000 = 74,700 \end{aligned}$$

The last step is to adjust this to 12/31/92:

$$1.08 * 74,700 = 80,676$$

In no event would the additional 412(1) charge exceed the amount of the unfunded current liability. In this problem, that value is 200,000.

answer is B

Note that it is incorrect to use the valuation rate of interest to adjust the 412(1) charge to 12/31/92. This gives 79,929 - in the wrong range.

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Problem 8 - Page 1

EAN is an individual cost method, and you should calculate the experience G/L each year. The expected UAL at 12/31/91 can be calculated based on the usual formula.

$$\begin{aligned} 12/31/91 \text{ } e\text{UAL} &= (1+i)(NC_0 + \text{UAL}_0) - \text{Contrib} + I \\ &= 1.08(20,000 + 125,000) - 22,500 \\ &= 134,100 \end{aligned}$$

The experience gain for 1991 is equal to the $e\text{UAL}$ minus the UAL:

$$\begin{aligned} 1992 \text{ UAL} &= 150,000 - 22,500 = 127,500 \\ \text{Gain} &= 134,100 - 127,500 = 6,600 \end{aligned}$$

$$\begin{aligned} 1992 \text{ NC+LA} &= 1.08 [25,000 + (125,000 - 6,600) \div \ddot{a}_{10|1.08}] \\ &= 1.08 [25,000 + 16,338] \\ &= 44,645 \end{aligned}$$

Since it appears that the minimum won't be larger than the maximum, you might be tempted to conclude that 44,645 is the answer. And that would be the wrong answer.

This is a very tricky problem, and the key is the expected UAL. It is important to note that the expected UAL is greater than last year's. The contribution paid for 1991 is less than the minimum, so there is a deficiency at 01/01/92!

$$\text{IAL amort} = 125,000 \div \ddot{a}_{30|1.08} = 10,281$$

Minimum Funding Standards Account for 1991

<u>Charges</u>		<u>Credits</u>	
Normal cost	20,000	Credit balance	-0-
IAL amort	10,281	12/31 contrib	22,500
Interest	2,422	Interest	-0-
	<hr/>		<hr/>
	32,703		22,500

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Problem 8 - Page 2

$$\text{Gain amort} = 6,600 \div \ddot{a}_{57}.08 = 1,531$$

Minimum Funding Standards Account for 1992

<u>Charges</u>		<u>Credits</u>	
Debit balance	10,203	Credit balance	-0-
Normal cost	25,000	Gain amort	1,531
IAL amort	10,281	Min cont 12/31	x
Interest	3,639	Interest	122
	<hr/>		<hr/>
	49,123		x+1,653

The minimum contribution at 12/31/92 is $49,123 - 1,653 = 47,470$.

answer is D

An alternative approach can be used in this problem. Since 1991 is the first plan year, and the contribution is paid at the end of the year, you could calculate the G/L using the formula for non-investment G/L. The reason is that there can be no G/L due to investments:

$$\begin{aligned} 12/31/91 \text{ } eAL &= (1+i)(NC_0 + AL_0) - \text{actual BP} \\ &= 1.08(20,000 + 125,000) - 0 \\ &= 156,600 \end{aligned}$$

The non-investment gain equals the eAL minus the AL:

$$1992 \text{ Gain} = 156,600 - 150,000 = 6,600$$

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Problem 9

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 the plan at 01/01/80, since that was the plan in effect five years before DOPT:

$$5.00 + 75\%(10.00) = 12.50 \text{ per month}$$

(1)	(2)	(3)	(4) = (1) * (2) * (3)
			Monthly
<u>Number of</u> <u>Participants</u>	<u>Years of</u> <u>Service</u>	<u>Benefit</u> <u>Rate</u>	<u>Guaranteed</u> <u>Benefits</u>
10	25	12.50	3,125
20	10	12.50	<u>2,500</u>
			5,625

answer is B

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Problem 10 - Page 1

With an aggregate type cost method, you must check the Full Funding Limitation. In this problem, you have both the actuarial and market values of assets, as well as the entry age normal valuation results, so you can calculate the FFL.

The starting point to calculate the deductible limit is the normal cost plus limit adjustments. You can use the IAL amortization charge to calculate the initial TYAB:

$$IAL = 16,000 * \ddot{a}_{30}^{108} = 194,535$$

$$\begin{aligned} 1992 \text{ NC+LA} &= 1.08 [25,000 + 194,535 \div \ddot{a}_{10}^{108}] \\ &= 1.08 [25,000 + 26,844] \\ &= 55,991 \end{aligned}$$

The Full Funding Limitation is always calculated adjusted with interest to the end of the year. The current liability is given at the end of the year. You must be careful not to credit interest on the end of year current liability.

The "new" FFL should be calculated using the asset values projected to the end of the year, and the "old" FFL should be calculated using (1+i) times the beginning of year values. The reason is that the end of year values include a benefit payment term with interest at the valuation rate. This should be used for the "new" FFL, since the end of year current liability term also includes a benefit payment term with interest at the current liability rate.

You also must adjust the 404 asset values for the carryover contribution. The calculation of the 404 FFL is based on Revenue Ruling 82-125.

$$\begin{aligned} \text{old 404 FFL} &= 1.08 (AL + NC - \text{lesser MVA, AAV}) + \text{carryover} \\ &= 1.08 (150,000 + 20,000 - 130,000) + 4,000 \\ &= 47,200 \end{aligned}$$

$$\begin{aligned} \text{new FFL} &= 1.5 [12/31 \text{ current liab}] - 1.08 * (\text{lesser MVA, AAV}) + \text{carryover} \\ &= 1.5 (120,000) - 140,000 + 4,000 \\ &= 180,000 - 136,000 = 44,000 \end{aligned}$$

Since the FFL is less than the normal cost plus limit adjustments, there is no point in calculating the minimum funding requirement under IRC Section 412 to see if it increases the deductible limit. The reason is that the 404 FFL can cut back the greater of the normal cost plus limit adjustments and the minimum under 412.

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Problem 10 - Page 2

Since the problem asks for the credit balance, you must complete the 1992 MFSA anyway. The contribution paid for 1992 equals the deductible limit of 44,000 less the carryover contribution of 4,000.

Minimum Funding Standards Account for 1992

<u>Charges</u>		<u>Credits</u>	
Normal cost	25,000	Credit balance	8,000
IAL amort	16,000	12/31 contrib	40,000
Interest	3,280	Interest	640
	<hr/>		<hr/>
	44,280		48,640

It is necessary to look at the 412 FFL to see if there is a Full Funding Credit. If so, it would produce a lower credit balance at 12/31/92. Based on the 404 calculations, you know the new FFL is lower:

$$\begin{aligned}\text{new 412 FFL} &= 1.5 [12/31 \text{ current liab}] - 1.08 * (\text{lesser MVA, AAV} - \text{CB}) \\ &= 1.5 (120,000) - (140,000 - 1.08(8,000)) \\ &= 180,000 - 140,000 + 8,640 = 48,640\end{aligned}$$

Since the FFL exceeds the AFD, there is no Full Funding Credit. The credit balance is $48,640 - 44,280 = 4,360$.

answer is B

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Problem 11 - Page 1

PLEASE NOTE: According to the ACTEX solutions, this problem is defective, and was not considered in the scoring of the 1992 exam. The reason it is defective is because of the negative UAL at 01/01/91. Based on Revenue Ruling 81-213, the 01/01/91 UAL should be limited to zero in calculating the expected UAL at 12/31/91.

You need to set up the MFSA for 1991 to calculate the minimum contribution for 1992. This is the only way to calculate the credit balance at 12/31/91.

Minimum Funding Standards Account for 1991

<u>Charges</u>		<u>Credits</u>	
Normal cost	100,000	Credit balance	-0-
IAL amort	-0-	12/31 contrib	85,000
Interest	7,000	Interest	-0-
	<hr/>		<hr/>
	107,000		85,000

Based on this MFSA, it appears that there is a debit balance at 12/31/91. You must check the Full Funding Limitation to see if there is a Full Funding Credit at 12/31/91.

$$\begin{aligned}
 \text{old FFL} &= 1.07 (\text{AL} + \text{NC} - (\text{lesser MVA, AAV} - \text{CB})) \\
 &= 1.07 (100,000 + 100,000 - (120,000 - 0)) \\
 &= 85,600
 \end{aligned}$$

$$\text{new FFL} = 72,705$$

Both Full Funding Limitations produce a Full Funding credit at 12/31/91. The Full Funding Credit equals the excess of the Accumulated Funding Deficiency (excluding credit balance and employer contribution) over the Full Funding Limitation. This equals $107,000 - 72,705 = 34,295$.

Minimum Funding Standards Account for 1991

<u>Charges</u>		<u>Credits</u>	
Normal cost	100,000	Credit balance	-0-
IAL amort	-0-	12/31 FFC	34,295
Interest	7,000	12/31 contrib	85,000
	<hr/>	Interest	-0-
	107,000		<hr/>
			119,295

The credit balance at 12/31/91 is $119,295 - 107,000 = 12,295$. Any existing MFSA bases at 01/01/91 are considered fully amortized at 01/01/92.

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11/25/95

Problem 11 - Page 2

There is a new OBRA FFC base set up at 01/01/92. The amount of the base is the additional FFC due to the 150% of current liability. The FFC resulting from the old FFL is $107,000 - 85,600 = 21,400$. The additional FFC equals $34,295 - 21,400 = 12,895$, which is the new OBRA FFC base.

$$\text{OBRA FFC amort} = 12,895 \div \ddot{a}_{107.07} = 1,716$$

Section 7 of RR 81-213 defines a "Special G/L" calculation which establishes an amortization base that FORCES the theoretical equation of balance to hold. Section 7 of RR 81-213 states that you can do a special determination of the G/L only when an experience loss has occurred, and when all of the prior amortization bases have been eliminated due to the Full Funding Credit. The proposed regulation at 1.412(b)-1(f)(2)(ii) contains basically the same rule, except that it does not require a loss to have occurred.

EAN is an individual cost method, and you normally would calculate the experience G/L each year. This year, you simply "back into" the amount of the base needed, and call that an experience loss base:

$$\begin{aligned} 01/01/92 \quad \text{UAL} &= 230,000 - 210,000 \\ &= 20,000 \end{aligned}$$

$$\begin{aligned} \text{UAL} &= \text{O/S bases} - \text{CB} - \text{ARA} \\ &= 12,895 \text{ OBRA base} + \text{LOSS base} - 12,295 \end{aligned}$$

$$\begin{aligned} \text{LOSS} &= 20,000 - 12,895 + 12,295 \\ &= 19,400 \end{aligned}$$

$$\text{Loss amort} = 19,400 \div \ddot{a}_{57.07} = 4,422$$

Minimum Funding Standards Account for 1992

<u>Charges</u>		<u>Credits</u>	
Normal cost	100,000	Credit balance	12,295
Loss amort	4,422		
OBRA FFC	1,716	12/31 contrib	x
Interest	7,430	Interest	861
	<hr/>		<hr/>
	113,568		x+13,156

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Problem 11 - Page 3

One last thing to check is the FFL at 12/31/92. The new FFL of 135,000 does not apply. The old FFL does not apply either:

$$\begin{aligned}\text{old FFL} &= 1.07 (AL + NC - (\text{lesser MVA,AAV} - CB)) \\ &= 1.07 (100,000 + 230,000 - (210,000 - 12,295)) \\ &= 141,556\end{aligned}$$

The minimum contribution at 12/31/92 is $113,568 - 13,156 = 100,412$.

answer is B

If you ignore the definition of the actual unfunded in Revenue Ruling 81-213, as well as the special rule in Section 7, you calculate the expected UAL without limiting the 01/01/91 UAL to zero, there is an experience loss of 19,400:

$$\begin{aligned}12/31/91 \text{ } e\text{UAL} &= (1+i)(NC_0 + \text{UAL}_0) - \text{Contrib} + I \\ &= 1.07(100,000 + 100,000 - 120,000) - 85,000 \\ &= 600\end{aligned}$$

The experience loss for 1991 is equal to the UAL minus the $e\text{UAL}$:

$$\begin{aligned}01/01/92 \text{ UAL} &= 230,000 - 210,000 = 20,000 \\ \text{Loss} &= 20,000 - 600 = 19,400\end{aligned}$$

This matches the "Special" loss base that we calculated previously, so it also produces the correct answer. I do not believe this is the correct approach to use in working this problem.

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Problem 12 - Page 1

This is a 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 before 1938, the limits for a Social Security Retirement Age of 65 are used. The dollar maximum of 112,221 at SSRA does not have to be adjusted.

The overall 415 limit is defined as the lesser of 112,221 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 six years of service at 01/01/92. Since the plan was started at 01/01/92, he has zero years of participation at 01/01/92. The pro-rata reduction can not reduce the benefit below 1/10th.

	Accrued Benefit as of 01/01/92
Years of service	6
Profit sharing benefit	800
Gross plan accrued benefit	$10,800 = 6 * 150 * 12$
Net plan accrued benefit	$10,000 = 10,800 - 800$
10,000 minimum floor	N/A due to DC plan
100% 3 yr high compensation	$24,000 = 4,000 + 11,000 + 9,000$
100% 3 yr average	$8,000 = 24,000 \div 3$
Pro-rate for years of service < 10	$4,800 = 8,000 * (6/10)$
Years of participation	0
Dollar maximum	112,221
Pro-rate for years of participation < 10	$11,221 = 112,221 * (1/10)$
Lesser of plan ben, or greater of (415 floor and lesser of 415 dollar or "FAE3" maximums)	4,800

This is calculated as follows:

lesser of 10,000 and greater of (-0- and
lesser of (4,800 and 11,221))

(Continued on the next page)

Problem 12 - Page 2

The last step in this problem is to check to see if the effect of the DC plan fraction under 415(e) reduces the benefit any further. One tricky aspect is that the reductions on the 415(b)(1) limitations in the denominator are always based on years of service. As a result, the DC fraction must be quite large before it will result in any further reduction in the DB plan benefit.

The maximum allowable 415(e) DB fraction is $1.0 - .25 = .75$.

$$\begin{aligned} \text{PB} &= \text{final projected benefit} \\ \text{DB fraction} &= .75 \\ .75 &= \text{PB} \div [\text{lesser of } 1.25 * 112,221 * (6/10) \text{ or } 1.40 * 8,000 * (6/10)] \\ \text{PB} &= 6,720 * .75 \\ &= 5,040 \end{aligned}$$

It appears that the 415(e) benefit exceeds the benefit of 4800 as limited under 415(b)(1). This is actually not true, due to the fact that the maximum DB fraction should be limited to .7143. This should be done because the final benefit is based on the 100% of 3 yr compensation limit, which produces a maximum DB fraction of

$$\begin{aligned} .7143 &= \frac{100\% (3 \text{ yr compensation})}{140\% (3 \text{ yr compensation})} \end{aligned}$$

Now you can recalculate the benefit under 415(e) based on the DB fraction of .7143:

$$\begin{aligned} .7143 &= \text{PB} \div [\text{lesser of } 1.25 * 112,221 * (6/10) \text{ or } 1.40 * 8,000 * (6/10)] \\ \text{PB} &= 6,720 * .7143 \\ &= 4,800 \end{aligned}$$

This benefit under 415(e) is equal to the benefit limited under 415(b)(1), so the final DB plan benefit is 4,800.

answer is B

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Problem 13

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.

12/31/91 "minimum requirement" = 190,000

01/01/92 credit balance = 280,000 contribution - 190,000 minimum
= 90,000

01/01/92 "minimum requirement" = 110,000 + 90,000 credit balance
= 200,000

RAP = lesser of 1991 or 90% of 1992 = 180,000

The required quarterly installment is based on the applicable percentage multiplied by the RAP. This equals $.25(180,000) = 45,000$.

You can take credit for the credit balance at 01/01/92 as if it was a payment toward the required quarterly contribution. The reason is that the contribution that creates the credit balance is actually in the trust fund at 01/01/92.

DATE	REQ'D QTRLY	Amount Available	Overpayment (Underpayment)
04/15/92	45,000	$90,000(1.08)^{3.5/12}$ = 92,043	47,043
07/15/92	45,000	$47,043(1.08)^{3/12}$ = 47,957	2,957
10/15/92	45,000	$2,957(1.08)^{3/12}$ = 3,014	(41,986)

A contribution of 41,986 at 10/15/92 avoids an interest penalty with respect to that contribution.

answer is C

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Problem 14

The problem states that a partial withdrawal occurred in 1991 due to a 70% decline in contribution base units. As a result, the initial year of the three year testing period would be considered as the year of withdrawal in a partial withdrawal calculation. 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 1989 to 1991. The base units for the "high base year" is the average of the two highest years in the preceding five year period (which are 1986 and 1987) which equals $\frac{1}{2}(1,300,000+1,200,000)$ or 1,250,000. 30% of the units for the "high base year" equals $.30(1,250,000) = 375,000$. Since the units for each year in the three year testing period are all less than 375,000, a 70% decline has 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 12/31/88 would be 650,000. You do not have enough information to calculate the de minimis amount at 12/31/88. Since it phases out dollar for dollar over 100,000, the deductible would be zero.

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 (1992) to (ii) the average base units during the five year period preceding the three year testing period. The fraction equals

$$1 - 250,000 \div [.20(900,000+900,000+1,300,000+1,200,000+600,000)]$$
$$1 - 250,000 \div 980,000 = .7449$$

$$650,000 (.7449) = 484,184$$

answer is D

Problem 15 - Page 1

ILP is an individual cost method, so you must calculate the experience G/L. In this problem, you have both the actuarial and market values of assets, so you can calculate the FFL.

The starting point to calculate the deductible limit is the normal cost plus limit adjustments. Under the ILP method, the IAL is zero. In general, there will be no amortization bases under 404 or 412 unless experience gains and losses have occurred. The only source of limit adjustments under 404 is the G/L for 1991.

$$12/31/91 \text{ } _e\text{UAL} = \text{O/S 412 bases} - \text{credit balance} = 0 - 0 = \text{zero}$$

The experience loss for 1991 is equal to the UAL minus the $_e\text{UAL}$:

$$\begin{aligned} 01/01/92 \text{ UAL} &= \text{AL} - \text{AAV} & \text{Participant age at 01/01/92 is 47} \\ \text{AL} &= \text{PVB} - \text{PVNC} & \text{Future service} = 62 - 47 = 15 \end{aligned}$$

$$\text{AL} = 100,000 - 8,000 * \ddot{a}_{\overline{15}|1.08} = 26,046$$

$$\begin{aligned} 01/01/92 \text{ UAL} &= 26,046 - 23,000 = 3,046 \\ \text{Loss} &= 3,046 - \text{zero} = 3,046 \end{aligned}$$

$$\begin{aligned} 1992 \text{ NC+LA} &= 1.08 [8,000 + 3,046 \div \ddot{a}_{\overline{10}|1.08}] \\ &= 1.08 [8,000 + 420] \\ &= 9,094 \end{aligned}$$

The Full Funding Limitation is always calculated adjusted with interest to the end of the year. The current liability is given at the end of the year. You must be careful not to credit interest on the end of year current liability.

$$\begin{aligned} \text{old 404 FFL} &= 1.08 (\text{AL} + \text{NC} - \text{lesser MVA,AAV}) + \text{carryover} \\ &= 1.08 (26,046 + 8,000 - 22,000) \\ &= 13,010 \end{aligned}$$

$$\begin{aligned} \text{new FFL} &= 1.5 [12/31 \text{ current liab}] - 1.08 * (\text{lesser MVA,AAV}) + \text{carryover} \\ &= 1.5 (22,800) - 1.08 * 22,000 \\ &= 10,440 \end{aligned}$$

The 404 FFL does not reduce the previously calculated deductible limit.

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Problem 15 - Page 2

The trick to this problem is that you must check the 412 minimum funding requirement. Since you only have the amortization of a loss, and there is no credit balance, the minimum contribution exceeds the normal cost plus limit adjustments!

$$\begin{aligned}\text{Loss amort} &= 3,046 \div \dot{a}_{57}.08 \\ &= 706\end{aligned}$$

Minimum Funding Standards Account for 1992

<u>Charges</u>		<u>Credits</u>	
Normal cost	8,000	Credit balance	-0-
Loss amort	706	12/31 contrib	x
Interest	697	Interest	-0-
<hr/>		<hr/>	
9,403		x	

It is necessary to look at the 412 FFL to see if there is a Full Funding Credit. If so, it would produce a lower minimum funding requirement at 12/31/92. Based on the 404 calculations, you know the new FFL is lower. Since there is no credit balance, the 412 FFL equals the 404 FFL.

The 412 FFL does not apply, so there is no Full Funding credit, and the minimum funding requirement is 9,403. Since this exceeds the normal cost plus limit adjustments of 9,094, the deductible limit becomes 9,403. The 404 FFL does not reduce this deductible limit, and the unfunded current liability does not increase the deductible limit.

answer is D

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Problem 16

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.

$$\begin{aligned}
 12/31/91 \text{ "minimum requirement"} &= 1.08 (100,000 + 1,000,000 \div \bar{a}_{30|1.08}) \\
 &= 1.08 (100,000 + 82,248) \\
 &= 196,827
 \end{aligned}$$

$$\begin{aligned}
 01/01/92 \text{ "minimum requirement"} &= 110,000 + 82,248 \\
 &= 192,248
 \end{aligned}$$

$$\text{RAP} = \text{lesser of 1991 or 90\% of 1992} = 173,023$$

The required quarterly installment is based on the applicable percentage multiplied by the RAP. This equals $.25(173,023) = 43,256$.

You can take credit for the credit balance at 01/01/92 as if it was a payment toward the required quarterly contribution. The reason is that the contribution that creates the credit balance is actually in the trust fund at 01/01/92. You should set up the MFSA for 1991 to calculate the credit balance at 01/01/92.

Minimum Funding Standards Account for 1991

<u>Charges</u>		<u>Credits</u>	
Normal cost	100,000	Credit balance	5,000
IAL amort	82,248	04/15 contrib	193,000
Interest	14,580	Interest	11,213
	196,827		209,213

The credit balance is $209,213 - 196,827 = 12,386$. At 04/15/92, the contribution to avoid a late quarterly contribution penalty is $43,256 - 12,667 = 30,589$. There is no remaining overpayment to bring forward to 07/15/92, so the contribution to avoid a late quarterly contribution penalty is the 43,256 required quarterly installment.

answer is B

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Problem 17

1991 is the initial year of this plan. You should use the EAN valuation results to establish the initial UAL. Then you can establish the credit balance at 12/31/91.

$$\begin{aligned}
 01/01/91 \text{ UAL} &= 530,000 = \text{O/S 412 bases} \\
 \text{PVNC} &= \text{PVB} - \text{AAV} - (\text{O/S 412 bases} - \text{CB} - \text{ARA}) \\
 &= 1,200,000 - 0 - 530,000 \\
 &= 670,000
 \end{aligned}$$

$$\begin{aligned}
 \text{PVE/E} &= 8,000,000 \div 400,000 = 20.0000 \\
 \text{NC} &= 670,000 \div 20.0000 = 33,500 \text{ at } 01/01/91
 \end{aligned}$$

The next step in the solution is to set up the MFSA for 1991.

$$\text{IAL amort} = 530,000 \div \bar{a}_{30|0.08} = 43,591$$

Minimum Funding Standards Account for 1991

<u>Charges</u>		<u>Credits</u>	
Normal cost	33,500	Credit balance	-0-
IAL amort	43,591	Actual cont 12/31	95,000
Interest	6,167	Interest	-0-
	83,258		95,000

The credit balance at 12/31/91 is $95,000 - 83,258 = 11,741$.

At 01/01/92, you should use the Aggregate cost method. The calculation of the normal cost must satisfy the formulas that are applicable to all reasonable funding methods (1.412(c)(3)-1):

$$\begin{aligned}
 \text{PV Fut Normal costs} &= \text{PV Future Benefits} - \text{Actuarial Assets} \\
 &\quad - \text{O/S 412 amortization bases} + \text{credit balance} + \text{ARA}
 \end{aligned}$$

In this problem, you can eliminate the IAL amortization base at 01/01/92.

$$\begin{aligned}
 01/01/92 \text{ PVNC} &= \text{PVB} - \text{AAV} - (\text{O/S 412 bases} - \text{CB} - \text{ARA}) \\
 &= 1,300,000 - 95,000 + 11,741 \\
 &= 1,216,741
 \end{aligned}$$

$$\begin{aligned}
 \text{PVE/E} &= 8,500,000 \div 450,000 = 18.8889 \\
 \text{NC} &= 1,216,741 \div 18.8889 = 64,416 \text{ at } 01/01/92
 \end{aligned}$$

The minimum contribution payable 01/01/92 is $64,416 - 11,741 = 52,675$.

answer is C

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Problem 18 - Page 1

The first step should be to calculate the normal cost plus limit adjustments. Under the Aggregate method, you have no ten year amortization bases, so the deductible limit is based solely on the normal cost:

$$\begin{aligned} 404 \text{ PVNC} &= \text{PVB} - \text{AAV} \\ &= 500,000 - 450,000 \\ &= 50,000 \end{aligned}$$

The 404 normal cost is 50,000 (01/01 with no interest), since the sole participant is age 64.

The final deductible limit for the year is actually 10,000. The reason is that IRC Section 404(a)(8) limits the deduction for self-employed individuals to the earned income, prior to any pension deductions.

There is no such limitation under IRC Section 412, so you should check to see if the minimum funding requirement is higher. At 01/01/92, you have a 30,000 OBRA FFC amortization base. The calculation of the normal cost must satisfy the formulas that are applicable to all reasonable funding methods (1.412(c)(3)-1):

$$\begin{aligned} \text{PV Fut Normal costs} &= \text{PV Future Benefits} - \text{Actuarial Assets} \\ &\quad - \text{O/S 412 amortization bases} + \text{credit balance} \end{aligned}$$

$$\begin{aligned} 01/01/92 \text{ PVNC} &= \text{PVB} - \text{AAV} - (\text{O/S 412 bases} - \text{CB}) \\ &= 500,000 - 450,000 - 30,000 + 4,000 \\ &= 24,000 \end{aligned}$$

$$\begin{aligned} \text{PVE/E} &= 1.0 \\ \text{NC} &= 24,000 \end{aligned}$$

The next step in the solution is to set up the MFSA for 1992.

$$\text{FFC amort} = 30,000 \div \ddot{a}_{\overline{10}|.08} = 4,140$$

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Problem 18 - Page 2

Minimum Funding Standards Account for 1992

<u>Charges</u>		<u>Credits</u>	
Normal cost	24,000	Credit balance	4,000
FFC amort	4,140	12/31 minimum	x
Interest	2,251	Interest	320
	<hr/>		<hr/>
	30,391		x+4,320

The minimum contribution payable 12/31/92 is $30,391 - 4,320 = 26,071$. Even though this exceeds the normal cost plus limit adjustments, the final deductible limit is still 10,000, due to the earned income limit.

It is incorrect to determine the excise tax based on the excess of the 60,000 contribution over the 10,000. This would give an answer range of 10% of 50,000, or 5,000. This is answer range D (just barely)

The key to the problem is that IRC Section 4972(c)(4) contains an exemption from the excise tax for self-employed individuals. You are allowed to treat any required contribution under 412 that exceeds the deductible limit as exempt from the excise tax.

As a result, the amount subject to penalty is the 60,000 contribution minus the 412 minimum requirement of 26,071, which gives 33,929. The excise tax is 10% of 33,929 or 3393.

answer is C

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Problem 19

This is a very easy question if you are familiar with the definition of a fiduciary. Fiduciaries are people who

- (1) exercise discretionary authority or control over management or disposition of plan assets, or
- (2) render investment advice for a fee or other compensation, or
- (3) exercise discretionary authority or responsibility for plan administration

The enrolled actuary is not a fiduciary, but the investment manager and the plan administrator both are fiduciaries. Both I and III are true.

answer is B

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Problem 20 - Page 1

This is a tricky PBGC guaranteed benefits question. It tests your knowledge of the five year phase-in of guaranteed benefits, and the allocation of assets. The first step is to see if the assets are sufficient to cover PC6 or PC5 benefits. If so, then you can avoid the calculation of the guaranteed benefits.

	SMITH	BROWN	
Past service at DOPT	6	5	
Age at DOPT	59	55	
Accrued Benefit 01/01/90 plan	100 (6) = 600/mo	100 (5) = 500/mo	
P.V factor	12 (7.3)	12 (5.4)	
PV of PC1->PC6 benefits	52,560	32,400	$\Sigma = 84,960$

The assets are not sufficient to cover all benefits through PC6, so now check the benefits through PC5:

Vested percentage	100%	80%	
PV of PC1->PC5 benefits	52,560	25,920	$\Sigma = 78,480$

Since the assets are not sufficient to cover PC5, you must calculate the PC4 benefits. The benefits in PC4 are defined based on the five year phase-in for ALL employees, even a substantial owner like Smith.

Guaranteed benefits are based on the vested benefits of the plan participants. 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.

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Problem 20 - Page 2

The change in plan benefits at 01/01/90 is subject to phase-ins at the DOPT of 12/31/92. The new benefits have been in effect for three years at DOPT.

	SMITH	BROWN	
Past service at DOPT	6	5	
Vested Accrued Benefit 01/01/87 plan	65(6) = 390/mo	65(5)(.8) = 260/mo	
Vested Accrued Benefit 01/01/90 plan	100(6) = 600/mo	100(5)(.8) = 400/mo	
Guaranteeable benefit increase	210	140	
Guaranteed Portion - original	390	260	
Guaranteed Portion - increase greater of \$60	.6(210) = 126	.6(140) = 84	
Total guaranteed benefit	390 + 126 = 516	260 + 84 = 344	
PV of PC1->PC4 benefits	45,202	22,291	$\Sigma = 67,493$

The assets are sufficient to cover the PC4 benefits, plus a portion of the benefits in PC5. You have to determine the amount of the PC5 liability based on each level of benefits in the 5 years prior to plan termination. You should allocate assets based the PC5 liability for each benefit increase.

You need to determine the level of benefits at which the assets will no longer cover 100% of the PC5 liability. Then you should allocate the assets as 100% of PC4, plus 100% of PC5 based on the prior benefit increases, plus a lesser percent of the partially funded benefit level.

The 01/01/87 plan vested accrued benefits shown above are lower than the PC4 benefits. The initial layer of PC5 benefits would be zero.

Allocation rule: $75,000 \text{ assets} = 100\% \text{ PC4} + \frac{(75,000 - 67,493)}{78,480 - 67,493} * \text{PC5}$

Assets allocated to PC4 and PC5 = $100\% \text{ PC4} + 68.33\% \text{ PC5}$

	SMITH	BROWN	
PV of PC1->PC5 benefits	52,560	25,920	$\Sigma = 78,480$
PV of PC1->PC4 benefits	45,202	22,291	$\Sigma = 67,493$
PV of PC5 benefits	7,358	3,629	$\Sigma = 10,987$
100% PC4 plus 68.33% PC5	50,229	24,771	$\Sigma = 75,000$

answer is A

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Problem 21

There are only a few aspects of this problem that are difficult. In some problems, the hardest thing to get straight is which valuation corresponds to which tax year. Usually you are only given one set of valuation results, which is valued at the correct valuation date.

The deductible limit for the taxable year ending 06/30/92 is based on the valuation for the plan year beginning in that tax year. The 01/01/92 valuation should be used to determine the deductible limit needed for the answer to this problem.

The first step should be to calculate the normal cost plus limit adjustments. The only ten year amortization base is the initial accrued liability. You must calculate the PVNC and the normal cost:

$$\begin{aligned} 404 \text{ PVNC} &= \text{PVB} - \text{AAV} - \text{UAL} \\ &= 800,000 - 0 - 300,000 \\ &= 500,000 \end{aligned}$$

$$\begin{aligned} \text{PVL} / \text{L} &= 1,600 \div 200 = 8.00 \\ \text{NC} &= 500,000 \div 8.00 = 62,500 \end{aligned}$$

$$\text{Limit adjustment} = 300,000 \div \ddot{a}_{\overline{10}|.07} = 39,919$$

The deductible limit is the normal cost plus limit adjustments adjusted with interest to the earlier of the end of the plan year, or the end of the tax year. In this problem, you adjust from 01/01/92 to 06/30/92:

$$\begin{aligned} \text{Deductible limit} &= (62,500 + 39,919) * (1 + .07(6/12)) \\ &= 106,004 \end{aligned}$$

Since this is the first year, the FFL does not affect the deductible limit. Similarly, the minimum contribution won't change it either.

$$\text{IAL amortization} = 300,000 \div \ddot{a}_{\overline{30}|.07} = 22,594$$

Minimum Funding Standards Account for 1992

<u>Charges</u>		<u>Credits</u>	
Normal cost	62,500	Credit balance	-0-
IAL amort	22,594	04/01 contrib	106,004
Interest	5,957	Interest	5,565
	91,051		111,569

The credit balance at 12/31/92 is $111,569 - 91,051 = 20,518$.

answer is B

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Problem 22

Section 411(c)(2) of the IRC defines the calculation of the employee provided accrued benefit. After the passage of OBRA '89, the 417(e) graded rates are used to accumulate the employee contributions plus interest (EECWI) from the determination date to normal retirement age. The resulting EECWI is converted to an annual annuity by dividing by an annuity at the immediate interest rate. For a normal form other than a life annuity, factors in Revenue Ruling 76-47 were used to adjust the resulting benefit.

The first step is to calculate the total accrued benefit at termination:

$$\begin{aligned}\text{Accrued benefit} &= 3\% * (40,000 + 50,000 + 60,000) \\ &= 4,500\end{aligned}$$

The next step is to calculate each year's employee contributions, and then the amount of the employee provided accrued benefit:

AS OF	4.5% EEC	EECWI
12/31/89	1,800	1,800
12/31/90	2,250	4,222 = 1,800(1.0957) + 2,250
12/31/91	2,700	7,335 = 4,222(1.0978) + 2,700

Smith is age 62 at 01/01/92, so the EECWI must be accumulated with interest at the first deferred rate for three years. The employee provided annual accrued benefit is calculated by dividing by the annuity value at the immediate interest rate.

$$\begin{aligned}\text{EE BEN} &= 7,335 * (1.0575)^3 \div 9.0 \\ &= 964\end{aligned}$$

The employer provided accrued benefit is $4,500 - 964 = 3,536$.

answer is B

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Problem 23

EAN is an individual cost method, so you must calculate the experience G/L. In this problem, you are given the only experience gain, which occurred during 1991. You don't have the market value of assets, so you can ignore the FFL. You must use the equation of balance to solve for the credit balance.

$$\begin{aligned} \text{UAL} &= \text{O/S 412 bases} - \text{CB} - \text{ARA} \\ \text{CB} &= \text{O/S 412 bases} - \text{UAL} - \text{ARA} \\ &= 300,000 + 90,000 + 45,000 - 20,000 - 370,000 - 0 \\ &= 45,000 \end{aligned}$$

Now you must calculate the various amortization payments based on the outstanding 412 bases. The tricky part is realizing that the IAL is amortized over 40 years from 01/01/76.

$$\begin{aligned} \text{IAL amort} &= 300,000 \div \ddot{a}_{\overline{24}|.08} = 26,383 & 92 - 76 &= 16 \\ \text{Waiver amort} &= 45,000 \div \ddot{a}_{\overline{10}|.08} = 6,210 & 92 - 87 &= 5 \\ \text{Amend amort} &= 90,000 \div \ddot{a}_{\overline{23}|.08} = 8,035 & 92 - 85 &= 7 \\ \text{Gain amort} &= 20,000 \div \ddot{a}_{\overline{5}|.08} = 4,638 \end{aligned}$$

Minimum Funding Standards Account for 1992

<u>Charges</u>		<u>Credits</u>	
Normal cost	35,000	Credit balance	45,000
IAL amort	26,383	Gain amort	4,638
Waiver amort	6,210		
Amend amort	8,035	12/31 contrib	x
Interest	6,050	Interest	3,971
	<hr/>		<hr/>
	81,678		x + 53,609

The minimum contribution at 12/31/92 is $81,678 - 53,609 = 28,069$.

answer is A

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Problem 24

This is an extremely easy multiple guess question on Section 415 limitations. All of the four statements are true.

answer is E

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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.

The change in plan benefits at 07/01/89 is subject to phase-ins at the DOPT of 12/31/92. The 07/01/89 benefits have been in effect for three full years at DOPT. Brown is subject to the 5 year phase in rules.

Smith is a substantial owner who is subject to the 30 year phase in. For the 30 year phase in, the original plan has been in effect for nine full years, from 01/01/84 to 01/01/93. The 04/01/87 plan benefits have been in effect for five full years at 01/01/93.

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.

(Continued on next page)

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Problem 25 - Page 2

	SMITH	BROWN
Past service at DOPT	9	11
Benefit - 01/01/84 plan	9(18) = 162.00	
Guaranteed Portion - original	162.00 * (9/30) = 48.60	
Benefit - 04/01/87 plan	9(30) = 270.00	11(30) 330.00
Guaranteeable benefit increase	270.00-162.00 = 108.00	330.00
Guaranteed Portion - increase	108.00 * (5/30) = 18.00	330.00 five year old plan
Benefit - 07/01/89 plan	9(35) = 315.00	11(35) 385.00
Guaranteeable benefit increase	315.00-270.00 = 45.00	385.00-330.00 = 55.00
Guaranteed Portion - increase	45.00 * (3/30) = 4.50	greater of 60% or \$60.00/mo = 55.00 *
Total guaranteed benefit	48.60+18.00+4.50 = 71.10	330.00+55.00 = 385.00

The total monthly guaranteed benefit is $71 + 385 = 456$. Note that the phase-in calculations for both employees are based on complete years that the benefits have been in effect.

* Note that the phase-in of the guaranteeable benefit increase can't exceed the total amount of the guaranteeable benefit increase.

answer is B

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Problem 26

The first step should be to calculate the normal cost plus limit adjustments. The only ten year amortization bases are the initial accrued liability and the experience loss for 1991.

$$\text{Limit adjustment} = (900,000 + 10,000) \div \ddot{s}_{\overline{10}|1.08} = 125,571$$

The deductible limit is the normal cost plus limit adjustments adjusted with interest to the earlier of the end of the plan year, or the end of the tax year.

$$\begin{aligned} \text{Deductible limit} &= 1.08 * (80,000 + 125,571) \\ &= 222,017 \end{aligned}$$

Since this is the first year, the FFL does not affect the deductible limit. Similarly, the minimum contribution won't change it either. However, since there are more than 100 participants, the unfunded current liability can be contributed and deducted. The final deductible limit is the UCL of 225,000.

$$\text{IAL amortization} = 900,000 \div \ddot{s}_{\overline{30}|1.08} = 74,023$$

$$\text{Loss amortization} = 10,000 \div \ddot{s}_{\overline{5}|1.08} = 2,319$$

Minimum Funding Standards Account for 1992

<u>Charges</u>		<u>Credits</u>	
Normal cost	80,000	Credit balance	70,000
IAL amort	74,023		
Loss amort	2,319	07/01 contrib	225,000
Interest	12,507	Interest	14,600
	<hr/>		<hr/>
	168,849		309,600

The credit balance at 12/31/92 is $309,600 - 168,849 = 140,751$.

answer is E

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Problem 27

There are 50 participants at 01/01/92, all of whom are 37 years old, with 7 years of service. All of these participants are 100% vested. The first step is to calculate the present value of vested benefits at the PBGC interest rate.

$$\begin{aligned}\text{Total accrued benefits} &= 2\% * 7 \text{ years} * 24,000 * 50 \text{ ees} \\ &= 168,000\end{aligned}$$

$$\begin{aligned}\text{PV of vested benefits} &= 168,000 * 100\% * 10.3 * (1.0616)^{37-65} \\ &= 324,520\end{aligned}$$

The asset value should be calculated to include the present value of the outstanding contributions:

$$\begin{aligned}\text{Asset value} &= 100,000 + 50,000 * (1.08)^{-6/12} \\ &= 148,113\end{aligned}$$

$$\begin{aligned}\text{Unfunded vested benefits liability} &= 324,520 - 148,113 \\ &= 176,407\end{aligned}$$

The variable premium rate is calculated as 9 times the next greater integer of the unfunded liability divided by 1,000. There is a limit of 53 on the per employee variable premium rate:

$$\text{Per employee variable premium} = 9 * 177 \div 50 = 31.86 \quad (\text{maximum of } 53)$$

$$\text{Total variable rate premium} = 50 * 31.86 = 1,593$$

answer is E

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Problem 28

EAN is an individual cost method, so you must calculate the experience G/L. In this problem, you are given the only experience gain, which occurred during 1990. When you have a change in cost method, you must establish a new base so that the equation of balance is satisfied:

$$\begin{aligned}\text{EAN UAL} &= \text{O/S 412 bases} - \text{CB} - \text{ARA} \\ &= \text{METHOD} + \text{O/S IAL base} + \text{O/S AMEND base} - \text{O/S GAIN base} - \text{CB}\end{aligned}$$

$$\begin{aligned}\text{METHOD} &= \text{UAL} - \text{O/S IAL base} - \text{O/S AMEND base} + \text{O/S GAIN base} + \text{CB} \\ &= 320,000 - 280,000 * \left(\ddot{a}_{\overline{25}|.08} \div \ddot{a}_{\overline{30}|.08} \right) \\ &\quad - 40,000 * \left(\ddot{a}_{\overline{27}|.08} \div \ddot{a}_{\overline{30}|.08} \right) \\ &\quad + 4,000 * \left(\ddot{a}_{\overline{4}|.08} \div \ddot{a}_{\overline{5}|.08} \right) + 2,500 \\ &= 320,000 - 265,500 - 38,854 + 3,318 + 2,500 \\ &= 21,464\end{aligned}$$

The amortization period for a charge base for a cost method change is based on the remaining number of years from the initial establishment of the MFSA for the plan:

$$\text{Method amort} = 21,464 \div \ddot{a}_{\overline{25}|.08} = 1,862$$

answer is C

Problem 29

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

You should add together the present value of vested and non-vested 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, or values for former key employees.

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.

A key employee includes anyone who satisfied the definition in the five years preceding the determination date. The definition of a key employee includes the following employees under 416(i)(1)(A):

- (i) an officer with compensation greater than 50% of the 415(b)(1)(A) dollar limit (e.g., 50% of \$112,221)
- (ii) one of the ten employees with compensation greater than the 415(c)(1)(A) dollar limit (\$30,000) owning the largest interests in the employer
- (iii) a 5% owner
- (iv) a 1% owner with more than \$150,000 compensation

The three employees Smith, Brown, and Green are identified as officers of the company. Smith and Brown are clearly key employees, but Green is not due to lack of ownership. White should be counted as a key employee, since the definition was satisfied in 1987.

The account balances for the key employees are

$$270,000 \text{ (Smith)} + 60,000 \text{ (Brown)} + 150,000 \text{ (White)} = 480,000$$

The account balances for the non-key employees are

$$40,000 \text{ (Green)} + 500,000 \text{ (non-key employees)} = 540,000$$

$$\text{The top-heavy ratio is } 480 / (480 + 540) = .471$$

answer is D

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Problem 30

- I. This is true. See Section 5 entitled "Requirements for Filing Method Selection." The instructions refer to "the actuarial value of the plan's assets determined ... without a reduction for any credit balance in the plan's funding standard account."
- II. This is true. See Section 5 entitled "Requirements for Filing Method Selection." The instructions state that the determination "must reflect the plan's population and provisions as of the last day of the plan year preceding the premium payment year."
- III. This is false. See Section 6 entitled "Significant Events." Section (b) entitled "Alternative Calculation Method" states that plans must reflect certain significant events in the calculation of unfunded vested benefits. Section (d) entitled "Significant Events" identifies the first significant event as a plan amendment which increases the costs by 5% or more.

answer is A

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Problem 31 - Page 1

The entry age normal cost method is an individual cost method. You must be careful to calculate gains and losses each year. The key to this problem is that you should assume the Alternative MFSA is not used in 1992. This is based on the general conditions for the exam. This problem is the first one involving the AMFSA that does not use an end of year valuation date.

The experience loss for 1990 is equal to the UAL minus the e UAL:

$$1991 \text{ UAL} = 95,000 - 75,000 = 20,000$$

$$1991 \text{ } e\text{UAL} = 1.08 * (60,000 + 0) - 1.08 (60,000) = 0$$

$$\text{Loss} = 20,000$$

Since the contribution of 60,000 was paid at 01/01/90, there is a zero credit balance in the regular MFSA at 12/31/90. Now you should check to see what the AMFSA produced for 1991:

Alternative Minimum Funding Standards Account for 1991

<u>Charges</u>		<u>Credits</u>	
Normal cost - lesser EAN/UC	70,000	Contrib 12/31	70,000
Excess of UC AL over MV assets	-0-		
Interest	5,600	Interest	0
	<hr/> 75,600		<hr/> 70,000

There is a debit balance of 5,600 at 12/31/91 in the AMFSA. In order to switch back to the regular MFSA for 1992, you must also check the regular MFSA for 1991:

$$\text{Loss amortization} = 20,000 \div 4.3108 = 4,638$$

Minimum Funding Standards Account for 1991

<u>Charges</u>		<u>Credits</u>	
Normal cost	80,000	Credit balance	0
Loss amort	4,638	Contrib 12/31	70,000
Interest	6,771	Interest	0
	<hr/> 91,409		<hr/> 70,000

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Problem 31 - Page 2

The debit balance at 12/31/91 in the regular MFSA is 91,409 - 70,000 = 21,409. When you switch back to the regular MFSA, the definition of the amount of the base is the excess of the debit balance in the regular MFSA over the debit balance in the AMFSA. This produces an AMFSA amortization base of 21,409 - 5,600 = 15,809, as well as a MFSA credit for the same amount. Note that the effect of this is to force the plan sponsor to pay off the 5,600 deficiency from the AMFSA.

$$\text{AMFSA switch-back amortization} = 15,809 \div \frac{5}{51.08} = 3,666$$

Minimum Funding Standards Account for 1992

<u>Charges</u>		<u>Credits</u>	
Debit balance	21,409	Credit balance	0
Normal cost	85,000		
Loss amort	4,638	Min contrib 12/31	x
Switch-back amort	3,666	Switch-back credit	15,809
Interest	9,177	Interest	1,265
	<hr/>		<hr/>
	123,890		17,074+x

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

$$123,890 = 17,074 + x$$

$$x = 106,817$$

answer is E

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Problem 32

The definition of priority category three includes all participants who could have been in (or were in) pay status three years prior to DOPT.

The benefit is calculated based on actual retirement date if already in pay status at DOPT-3. Otherwise, the benefit must be calculated assuming retirement at DOPT-3. In either case, the benefit provisions are the lowest level of plan benefits in the five years preceding DOPT. The retirement eligibility is based on the plan provision at DOPT-3.

With a DOPT of 01/01/92, you must calculate retirement benefits at 01/01/89. First, check to be sure the participants are actually in priority category three:

	SMITH	BROWN
Age at 01/01/89	60	61
Past service at 01/01/89	19	24
Eligible to retire at 01/01/89	NO	YES
FAB3 at 01/01/89		30,000
Accrued benefit at 01/01/89		$30,000 * (24/28) * .3$ = 7,714
Early retirement benefit at 01/01/89		$7,714 * (1 - 4(.05))$ = 6,171 or 514/mo

answer is A

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Problem 33

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.

12/31/91 "minimum requirement":

$$1.08 (50,000 + 100,000 \div \ddot{a}_{\overline{29}|.08} + 50,000 \div \ddot{a}_{\overline{51}|.08} = 75,485$$

01/01/92 "minimum requirement":

$$40,000 + 100,000 \div \ddot{a}_{\overline{29}|.08} + 50,000 \div \ddot{a}_{\overline{51}|.08} + 40,000 \div \ddot{a}_{\overline{51}|.08} = 69,169$$

$$\text{RAP} = \text{lesser of 1991 or 90\% of 1992} = 62,252$$

The required quarterly installment is based on the applicable percentage multiplied by the RAP. This equals $.25(62,252) = 15,563$.

The key to the problem is that you do not have to do any detailed calculation of interest penalties. The reason is that the payments of 16,000 and 32,000 prevent any underpayments. Here is a quick example, **ignoring the interest accumulation normally applied to overpayments:**

DATE	REQ'D QTRLY	Amount Available	Overpayment (Underpayment)		
04/15/92	15,563	16,000	437	paid 16,000	03/31
07/15/92	15,563	32,437	16,874	paid 32,000	06/30
10/15/92	15,563	16,874	1,311		
12/31/92	-0-	final pmt			

You should set up the MFSA for 1992 to calculate the final contribution payment at 12/31/92.

Minimum Funding Standards Account for 1992

<u>Charges</u>		<u>Credits</u>	
Normal cost	40,000	Credit balance	0
IAL amort	8,298	03/31 contrib	16,000
Loss amort	20,871	06/30 contrib	32,000
		12/31 contrib	x
Interest	5,534	Interest	2,240
	<hr/>		<hr/>
	74,703		x+50,240

The minimum contribution is $74,703 - 50,240 = 24,463$. The whole point of the problem is to make you waste time doing a detailed calculation of the non-existent interest penalty for 1992.

answer is D

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Problem 34 - Page 1

This is a 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 before 1938, the limits for a Social Security Retirement Age of 65 are used. The dollar maximum of 112,221 at SSRA does not have to be adjusted.

The overall 415 limit is defined as the lesser of 112,221 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 10 years of service at 01/01/92. Since the plan was started at 01/01/85, he has 7 years of participation at 01/01/92. The pro-rata reduction can not reduce the benefit below 1/10th.

	Annual Benefit as of 01/01/92
Years of service	10
3 yr average pay	$140,000 = 420,000 \div 3$
Plan accrued benefit	140,000
10,000 minimum floor	N/A due to DC plan
100% 3 yr high compensation	140,000
Years of participation	7
Dollar maximum	112,221
Pro-rate for years of participation < 10	$78,555 = 112,221 * (7/10)$
Lesser of plan ben, or greater of (415 floor and lesser of 415 dollar or "FAE3" maximums)	
	78,555

This is calculated as follows:

lesser of 140,000 and greater of (-0- and
lesser of (78,555 and 140,000))

(Continued on the next page)

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Problem 34 - Page 2

The last step in this problem is to check to see if the effect of the DC plan fraction under 415(e) reduces the benefit any further. One tricky aspect is that the reductions on the 415(b)(1) limitations in the denominator are always based on years of service. As a result, the DC fraction must be quite large before it will result in any further reduction in the DB plan benefit.

The maximum allowable 415(e) DB fraction is $1.0 - .40 = .60$

PB = final projected benefit

DB fraction = .60

= $PB \div [\text{lesser of } 1.25 * 112,221 * (10/10) \text{ or } 1.40 * 140,000 * (10/10)]$

PB = $140,276 * .60$

= 84,166

This benefit under 415(e) is greater than the benefit limited under 415(b)(1), so the final DB plan benefit is 78,555.

answer is D

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Problem 35

Since you don't have any Entry Age Normal valuation results, you can ignore the effect of the Full Funding Limitation. The only trick to the problem is that you must pro-rate the additional 412(1) funding charge, since the highest number of plan participants is less than 150.

The MFSA charges should be increased by the Unpredictable Contingent Event amount plus the excess, if any, of the DRC over the MFSA charges and credits specified in Section 412(1). The DRC is defined as the sum of the unfunded old liability amount (UOLA) and the unfunded new liability amount (UNLA). In this problem, you are told there are no unpredictable contingent events.

The UOLA equals the amortization of the remaining portion of the unfunded old liability over a period that was 18 years at 1-1-89. You are given the UOLA as 45,526 in this problem.

The UNLA is defined as the unfunded new liability times the applicable percentage, which is $30\% - 25\%(\text{FCL}\% - 35\%)$. In this problem, you must calculate this percentage.

$$\begin{aligned}\text{FCL}\% &= (\text{AAV} - \text{CB}) / \text{CL} \\ &= (2,000,000 - 60,000) \div 2,500,000 = 77.6\%\end{aligned}$$

$$\begin{aligned}\text{APP}\% &= .30 - .25[.776 - .350] \\ &= 19.35\%\end{aligned}$$

The unfunded new liability is the excess of the unfunded current liability over the remaining portion of the unfunded old liability. The unfunded current liability is defined as the excess of the current liability over the actuarial asset value, reduced by the credit balance.

$$\begin{aligned}\text{UCL} &= 2,500,000 - (2,000,000 - 60,000) \\ &= 560,000 \\ \text{UNL} &= 560,000 - 400,000 = 160,000 \\ \text{UNLA} &= 160,000 * 19.35\% = 30,960 \\ \text{DRC} &= 45,526 + 30,960 = 76,486\end{aligned}$$

You must subtract the IAL amortization charge under 412(b) from the DRC to calculate the additional 412(1) charge.

$$\begin{aligned}\text{01/01 412(1) charge} &= 76,486 - 40,000 = 36,486 \text{ before pro-rata} \\ \text{Pro-rata charge} &= 36,486 * 2\% * (145 - 100) \\ &= 36,486 * 90\% = 32,837\end{aligned}$$

The last step is to bring the 412(1) charge forward to the end of the year with interest at the current liability rate.

$$\text{12/31 412(1) charge} = 1.09(32,837) = 35,793$$

answer is D