Paper: CCIR.ARinstr (Alphabet City (Model 18.F Q16)) 05 a-Question
Problem: calculate (A,B,C,D,E,F,G,H,J,K) - there is no "I"
Problem Type: 2018.Fall #16

Balance Sheet

Page 20.10 Asset	2017	2016	
recoverable from reinsurers:			
UEP	n/a	6,370	<== ceded values
UCAE	A	9,660	<== ceded values
total investments including cash	93,700	62,000	

Page 20.20 Liabilities & Equity	2017	2016	
UEP	J	9,100	<== gross values
UCAE	B	13,800	<== gross values

Income Statement

Page 20.30 Statement of Income	2017	2016
NWP	49,000	41,300
NEP	41,100	n/a
GROSS claims & adjustment expenses	C	n/a
REINSURER'S SHARE of claims & adj exps	D	n/a
NET claims & adjustment expenses	E	n/a
NET investment income	5,600	n/a

Runoff

CY	Page 60.41 Net Clms & Adj Exps Runoff Discounted		AY 2016	AY 2017	AY 2017 & prior
2016	UCAE	end of year	3,200		
	IBNR	end of year	4,200		
2017	Paid	*during year*	F	n/a	n/a
	UCAE	end of year	3,200	n/a	7,100
	IBNR	end of year	3,600	n/a	K
	investment income from UCAE & IBNR		G		
	Amount:	*excess/deficiency*	n/a		
	Ratio:	*excess/deficiency*	H		

Bond Portfolio

rating	class	book val.	mkt. val.	duration	yield
govt	HTM	9,000	7,380	0.8	1.1%
AAA	HTM	5,000	4,850	6.0	2.2%
A	HTM	3,000	3,570	3.0	5.2%

Triangle Data

GROSS paid loss (cumulative)

AY	12	24
2016	3,200	9,000
2017	3,100	

GROSS unpaid loss (undiscounted)

AY	12	24
2016	n/a	9,400
2017	12,100	

Payment Pattern *(incremental)*

year 1	30%
year 2	10%
year 3	60%

MfADs

MfAD (claims):	6.00%
MfAD (re):	4.00%
MfAD (inv):	1.50%

* reinsurance quota-share RETENTION ==> **70%**

Step 1: calculate the discount rate as a weighted average of the yields in the bond portfolio

weight *	yield	
7,020	1.1%	
30,000	2.2%	
9,000	5.2%	
	2.62%	<== discount rate

* weight = (book value) x duration

Step 2a: calculate the gross PV for AY 2017 and AY 2016 *(gross of quota-share reinsurance)* at **2.62%**

AY 2017: unpaid = 12,100 *(at 12 months)*

PV_{17}	=	10%	/	70%	x	12,100	/	1.0262 ^ 0.5
	+	60%	/	70%	x	12,100	/	1.0262 ^ 1.5
	=	1,706	+	9,977				
	=	**11,683**						

AY 2016: unpaid = 9,400 *(at 24 months)*

PV_{16}	=	60%	/	60%	x	9,400	/	1.0262 ^ 0.5
	=	**9,279**						

==> gross PV for both AYs at: **2.62%** is **20,962**

Step 2b: calculate the gross PV for AY 2017 and AY 2016 *(gross of quota-share reinsurance)* at **1.12%**

==> gross PV for both AYs at: **1.12%** is 21,266 *(similar calculation to Step 1)*

Step 3a:	gross APV	=	21,266	+	6.00%	x	**20,962**	=	**22,524**

Step 3b:	net APV	=	21,266	x	70%		
		+	**20,962**	x	70%	x	6.00%
		+	20,962	x	30%	x	4.00%
		=	**16,018**				

Step 3c:	ceded APV	=	22,524	-	16,018	=	**6,506**

Now we can start filling in the values for the letters:

A & B are very easy: *(B is the net claims **liability** , A is the reinsurance recoverable **asset**)*

A	=	6,506	UCAE recoverable from reinsurer	(Step 3c)
B	=	22,524	gross UCAE liability	(Step 3a)

C, D & E are more confusing:

C = the GROSS "income" due to GROSS claims in 2017 *(think of it as **negative** income)*

=	(2017 gross UCAE)	-	(2016 gross UCAE)	+	(gross paid in 2017) *	
=	B	-	*given info*	+	*from paid triangle*	
=	22,524	-	13,800	+	**8,900**	
=	17,624					

(gross paid in 2017)

=	2016 @ 24	-	2016 @ 12	+	2017 @ 12
=	9,000	-	3,200	+	3,100
=	**8,900**				

D = the CEDED "income" due to CEDED claims in 2017 *(this is a **recoverable**)*

=	(2017 ceded UCAE)	-	(2016 ceded UCAE)	+	(ceded paid in 2017) **
=	A	-	*given info*	+	*see below*
=	6,506	-	9,660	+	**2,670**
=	-484				

(ceded paid in 2017)

=	gross paid in 2017	x	30%
=	8,900	x	30%
=	**2,670**		

E = net "income" due to claims in 2017 *(this is also **negative** income)*

=	C	-	D
=	17,624	-	-484
=	18,108		

F is easy: **if** you know that the year labels in the **left** column of the table represent **Calendar Years** **and** the year labels in the **top** row represent **Accident Years**

Use the paid loss triangle and the quota-share percentage

F	=	qs%	x	(	AY 2016 paid in CY 2017			)
	=	70%	x	(	9,000	-	3,200	)
	=	4,060						

G & H are related: H is the **excess (deficiency) ratio** and G is the **investment income** in the excess (deficiency) formula

You might like to review the practice template for the excess (defiency) ratio before proceding! In any case, we first need to calculate G. Note that UCAE + IBNR are directly from the **Runoff exhibit** in the given info.

G	=	(investment yield) *		x	avg [$(UCAE+IBNR)_{beg\ of\ 17}$, $(UCAE + IBNR)_{end\ of\ 17}$]			
	=	7.46%		x	avg [	7,400	,	6,800]
	=	530						

**** investment yield***

	=	2	x	NII				
	/	[$(invested\ assets)_{beg\ of\ 17}$ + $(invested\ assets)_{end\ of\ 17}$ - NII]						
	=	2	x	5,600				
	/	[	93,700	+	62,000	-	5,600	]
	=	**7.46%**						

NII or net investment income comes from the **Income Statement**
invested assets come from the **Balance Sheet**

H = $[(UCAE + IBNR)_{AY16\ @\ 12} - (UCAE + IBNR)_{AY16\ @\ 24} - (net\ Pd)_{12\text{-}24} + G] / (UCAE + IBNR)AY16\ @\ 12$

Now:

$(UCAE + IBNR)_{AY16\ @\ 12}$	=	3,200	+	4,200	=	7,400
$(UCAE + IBNR)_{AY16\ @\ 24}$	=	3,200	+	3,600	=	6,800
$(net\ Pd)_{12\text{-}24}$	=	F			=	4,060

Therefore:

H = -39.6% **<== Excess (Deficiency) Ratio**

J is hard: J is **(gross UEP)$_{17}$** but we can't find that directly. We must first find **(net UEP)$_{17}$**.

Recall the standard formula for EP in terms of WP and UEP:

EP	=	WP	-	chg(UEP)

Apply this to our situation to obtain:

NEP$_{17}$	=	NWP$_{17}$	-	[(net UEP)$_{17}$ - (net UEP)$_{16}$]
41,100	=	49,000	-	[(net UEP)$_{17}$ - ((gross UEP)$_{16}$ - (ceded UEP)$_{16}$)]

Ok, this is getting messy so I'm going to let you do the algebra. Substitute these values above:

(gross UEP)$_{16}$	=	9,100	*<== from **Page 20.20** Balance Sheet*
(ceded UEP)$_{16}$	=	6,370	*<== from Page **20.10** Balance Sheet*

The result is:

(net UEP)$_{17}$	=	10,630

And finally, using the **quota-share percentage** to GROSS UP this net value, we obtain:

(gross UEP)$_{17}$	=	(net UEP)$_{17}$	/	**70%**
J	=	10,630	/	70%
J	=	15,186		

K (finally): K is (net IBNR)$_{17\ \&\ prior}$ and the standard formula is IBNR = (Total Liabilities) - Case

(net IBNR)$_{17\ \&\ prior}$	=	(net APV)$_{17\ \&\ prior}$	-	(net Case)$_{17\ \&\ prior}$

where

(net APV)$_{17\ \&\ prior}$	=	16,018	***<== from Step 3b***
(net Case)$_{17\ \&\ prior}$	=	7,100	***<== from Runoff Exhibit (2017 UCAE for 2017 & prior)***

therefore

K	=	16,018	-	7,100
	=	8,918		

Solution Summary:

A	=	6,506
B	=	22,524
C	=	17,624
D	=	-484
E	=	18,108

F	=	4,060
G	=	530
H	=	-39.6%
J	=	15,186
K	=	8,918

Paper: CCIR.ARinstr (Alphabet City (Model 18.F Q16)) 06 a-Question
Problem: calculate (A,B,C,D,E,F,G,H,J,K) - there is no "I"
Problem Type: 2018.Fall #16

Balance Sheet

Page 20.10 Asset	2017	2016	
recoverable from reinsurers:			
UEP	n/a	6,720	<== ceded values
UCAE	A	8,640	<== ceded values
total investments including cash	87,200	83,600	

Page 20.20 Liabilities & Equity	2017	2016	
UEP	J	11,200	<== gross values
UCAE	B	14,400	<== gross values

Income Statement

Page 20.30 Statement of Income	2017	2016
NWP	50,000	42,200
NEP	51,400	n/a
GROSS claims & adjustment expenses	C	n/a
REINSURER'S SHARE of claims & adj exps	D	n/a
NET claims & adjustment expenses	E	n/a
NET investment income	5,500	n/a

Runoff

CY	Page 60.41 Net Clms & Adj Exps Runoff Discounted		AY 2016	AY 2017	AY 2017 & prior
2016	UCAE	end of year	3,100		
	IBNR	end of year	4,600		
2017	Paid	*during year*	F	n/a	n/a
	UCAE	end of year	2,800	n/a	6,400
	IBNR	end of year	3,500	n/a	K
	investment income from UCAE & IBNR		G		
	Amount:	*excess/deficiency*	n/a		
	Ratio:	*excess/deficiency*	H		

Bond Portfolio

rating	class	book val.	mkt. val.	duration	yield
govt	HTM	12,000	13,080	1.4	1.4%
AAA	HTM	1,000	830	10.0	2.7%
A	HTM	10,000	9,300	4.0	6.7%

Triangle Data

GROSS paid loss (cumulative)

AY	12	24
2016	3,500	8,300
2017	2,700	

GROSS unpaid loss (undiscounted)

AY	12	24
2016	n/a	10,800
2017	10,100	

Payment Pattern *(incremental)*

year 1	40%
year 2	30%
year 3	30%

MfADs

MfAD (claims):	18.00%
MfAD (re):	5.00%
MfAD (inv):	0.50%

* reinsurance quota-share RETENTION ==> **60%**

Step 1: calculate the discount rate as a weighted average of the yields in the bond portfolio

weight *	yield	
16,920	1.4%	
10,000	2.7%	
40,000	6.7%	
	4.76%	<== discount rate

* weight = (book value) x duration

Step 2a: calculate the gross PV for AY 2017 and AY 2016 *(gross of quota-share reinsurance)* at **4.76%**

AY 2017: unpaid = 10,100 *(at 12 months)*

PV_{17}	=	30%	/	60%	x	10,100	/	1.0476 ^ 0.5
	+	30%	/	60%	x	10,100	/	1.0476 ^ 1.5
	=	4,934	+	4,710				
	=	**9,644**						

AY 2016: unpaid = 10,800 *(at 24 months)*

PV_{16}	=	30%	/	30%	x	10,800	/	1.0476 ^ 0.5
	=	**10,552**						

==> gross PV for both AYs at: **4.76%** is **20,195**

Step 2b: calculate the gross PV for AY 2017 and AY 2016 *(gross of quota-share reinsurance)* at **4.26%**

==> gross PV for both AYs at: **4.26%** is 20,266 *(similar calculation to Step 1)*

Step 3a:	gross APV	=	20,266	+	18.00%	x	**20,195**	=	**23,902**

Step 3b:	net APV	=	20,266	x	60%		
		+	**20,195**	x	60%	x	18.00%
		+	20,195	x	40%	x	5.00%
		=	**14,745**				

Step 3c:	ceded APV	=	23,902	-	14,745	=	**9,157**

Now we can start filling in the values for the letters:

A & B are very easy: *(B is the net claims **liability** , A is the reinsurance recoverable **asset**)*

A	=	9,157	UCAE recoverable from reinsurer	(Step 3c)
B	=	23,902	gross UCAE liability	(Step 3a)

C, D & E are more confusing:

C = the GROSS "income" due to GROSS claims in 2017 *(think of it as **negative** income)*

=	(2017 gross UCAE)	-	(2016 gross UCAE)	+	(gross paid in 2017) *	
=	B	-	*given info*	+	*from paid triangle*	
=	23,902	-	14,400	+	**7,500**	
=	17,002					

(gross paid in 2017)

=	2016 @ 24	-	2016 @ 12	+	2017 @ 12
=	8,300	-	3,500	+	2,700
=	**7,500**				

D = the CEDED "income" due to CEDED claims in 2017 *(this is a **recoverable**)*

=	(2017 ceded UCAE)	-	(2016 ceded UCAE)	+	(ceded paid in 2017) **
=	A	-	*given info*	+	*see below*
=	9,157	-	8,640	+	**3,000**
=	3,517				

(ceded paid in 2017)

=	gross paid in 2017	x	40%
=	7,500	x	40%
=	**3,000**		

E = net "income" due to claims in 2017 *(this is also **negative** income)*

=	C	-	D
=	17,002	-	3,517
=	13,485		

F is easy: **if** you know that the year labels in the **left** column of the table represent **Calendar Years** **and** the year labels in the **top** row represent **Accident Years**

Use the paid loss triangle and the quota-share percentage

F	=	qs%	x	(	AY 2016 paid in CY 2017			)
	=	60%	x	(	8,300	-	3,500	)
	=	2,880						

G & H are related: H is the **excess (deficiency) ratio** and G is the **investment income** in the excess (deficiency) formula

You might like to review the practice template for the excess (defiency) ratio before proceding! In any case, we first need to calculate G. Note that UCAE + IBNR are directly from the **Runoff exhibit** in the given info.

G	=	(investment yield) *		x	avg [$(UCAE+IBNR)_{beg\ of\ 17}$, $(UCAE + IBNR)_{end\ of\ 17}$]			
	=	6.65%		x	avg [	7,700	,	6,300]
	=	466						

**** investment yield***

	=	2	x	NII				
	/	[(invested assets)$_{beg\ of\ 17}$ + (invested assets)$_{end\ of\ 17}$ - NII]						
	=	2	x	5,500				
	/	[	87,200	+	83,600	-	5,500	]
	=	**6.65%**						

NII or net investment income comes from the **Income Statement**
invested assets come from the **Balance Sheet**

H = [$(UCAE + IBNR)_{AY16\ @\ 12}$ - $(UCAE + IBNR)_{AY16\ @\ 24}$ - $(net\ Pd)_{12-24}$ + G] / $(UCAE + IBNR)_{AY16\ @\ 12}$

Now:

$(UCAE + IBNR)_{AY16\ @\ 12}$	=	3,100	+	4,600	=	7,700
$(UCAE + IBNR)_{AY16\ @\ 24}$	=	2,800	+	3,500	=	6,300
$(net\ Pd)_{12-24}$	=	F			=	2,880

Therefore:

H = -13.2% **<== Excess (Deficiency) Ratio**

J is hard: J is **(gross UEP)$_{17}$** but we can't find that directly. We must first find **(net UEP)$_{17}$**.

Recall the standard formula for EP in terms of WP and UEP:

EP	=	WP	-	chg(UEP)

Apply this to our situation to obtain:

NEP_{17}	=	NWP_{17}	-	[$(net\ UEP)_{17}$ - $(net\ UEP)_{16}$]
51,400	=	50,000	-	[$(net\ UEP)_{17}$ - ($(gross\ UEP)_{16}$ - $(ceded\ UEP)_{16}$)]

Ok, this is getting messy so I'm going to let you do the algebra. Substitute these values above:

$(gross\ UEP)_{16}$	=	11,200	*<== from **Page 20.20** Balance Sheet*
$(ceded\ UEP)_{16}$	=	6,720	*<== from Page **20.10** Balance Sheet*

The result is:

$(net\ UEP)_{17}$	=	3,080

And finally, using the **quota-share percentage** to GROSS UP this net value, we obtain:

$(gross\ UEP)_{17}$	=	$(net\ UEP)_{17}$	/	**60%**
J	=	3,080	/	60%
J	=	5,133		

K (finally): K is $(net\ IBNR)_{17\ \&\ prior}$ and the standard formula is IBNR = (Total Liabilities) - Case

$(net\ IBNR)_{17\ \&\ prior}$	=	$(net\ APV)_{17\ \&\ prior}$	-	$(net\ Case)_{17\ \&\ prior}$

where

$(net\ APV)_{17\ \&\ prior}$	=	14,745	***<== from Step 3b***
$(net\ Case)_{17\ \&\ prior}$	=	6,400	***<== from Runoff Exhibit (2017 UCAE for 2017 & prior)***

therefore

K	=	14,745	-	6,400
	=	8,345		

Solution Summary:

A	=	9,157
B	=	23,902
C	=	17,002
D	=	3,517
E	=	13,485

F	=	2,880
G	=	466
H	=	-13.2%
J	=	5,133
K	=	8,345

Paper: CCIR.ARinstr (Alphabet City (Model 18.F Q16)) 07 a-Question
Problem: calculate (A,B,C,D,E,F,G,H,J,K) - there is no "I"
Problem Type: 2018.Fall #16

Balance Sheet

Page 20.10 Asset	2017	2016	
recoverable from reinsurers:			
UEP	n/a	4,550	<== ceded values
UCAE	A	5,040	<== ceded values
total investments including cash	55,200	52,000	

Page 20.20 Liabilities & Equity	2017	2016	
UEP	J	6,500	<== gross values
UCAE	B	7,200	<== gross values

Income Statement

Page 20.30 Statement of Income	2017	2016
NWP	32,000	24,600
NEP	30,300	n/a
GROSS claims & adjustment expenses	C	n/a
REINSURER'S SHARE of claims & adj exps	D	n/a
NET claims & adjustment expenses	E	n/a
NET investment income	3,000	n/a

Runoff

CY	Page 60.41 Net Clms & Adj Exps Runoff Discounted		AY 2016	AY 2017	AY 2017 & prior
2016	UCAE	end of year	2,600		
	IBNR	end of year	2,800		
2017	Paid	*during year*	F	n/a	n/a
	UCAE	end of year	1,500	n/a	4,100
	IBNR	end of year	2,700	n/a	K
	investment income from UCAE & IBNR		G		
	Amount:	*excess/deficiency*	n/a		
	Ratio:	*excess/deficiency*	H		

Bond Portfolio

rating	class	book val.	mkt. val.	duration	yield
govt	HTM	12,000	11,880	1.7	1.5%
AAA	HTM	6,000	4,800	10.0	3.1%
A	HTM	8,000	6,560	4.0	5.2%

Triangle Data

GROSS paid loss (cumulative)

AY	12	24
2016	2,300	5,400
2017	2,300	

GROSS unpaid loss (undiscounted)

AY	12	24
2016	n/a	7,200
2017	7,300	

Payment Pattern *(incremental)*

year 1	30%
year 2	20%
year 3	50%

MfADs

MfAD (claims):	17.00%
MfAD (re):	4.00%
MfAD (inv):	0.25%

* reinsurance quota-share RETENTION ==> **70%**

Step 1: calculate the discount rate as a weighted average of the yields in the bond portfolio

weight *	yield	
20,280	1.5%	
60,000	3.1%	
32,000	5.2%	
	3.41%	<== discount rate

* weight = (book value) x duration

Step 2a: calculate the gross PV for AY 2017 and AY 2016 *(gross of quota-share reinsurance)* at **3.41%**

AY 2017: unpaid = 7,300 *(at 12 months)*

PV_{17}	=	20%	/	70%	x	7,300	/	1.0341 ^ 0.5
	+	50%	/	70%	x	7,300	/	1.0341 ^ 1.5
	=	2,051	+	4,959				
	=	**7,010**						

AY 2016: unpaid = 7,200 *(at 24 months)*

PV_{16}	=	50%	/	50%	x	7,200	/	1.0341 ^ 0.5
	=	**7,080**						

==> gross PV for both AYs at: **3.41%** is **14,090**

Step 2b: calculate the gross PV for AY 2017 and AY 2016 *(gross of quota-share reinsurance)* at **3.16%**

==> gross PV for both AYs at: **3.16%** is 14,119 *(similar calculation to Step 1)*

Step 3a:	gross APV	=	14,119	+	17.00%	x	**14,090**	=	**16,514**

Step 3b:	net APV	=	14,119	x	70%		
		+	**14,090**	x	70%	x	17.00%
		+	14,090	x	30%	x	4.00%
		=	**11,729**				

Step 3c:	ceded APV	=	16,514	-	11,729	=	**4,785**

Now we can start filling in the values for the letters:

A & B are very easy: *(B is the net claims **liability** , A is the reinsurance recoverable **asset**)*

A	=	4,785	UCAE recoverable from reinsurer	(Step 3c)
B	=	16,514	gross UCAE liability	(Step 3a)

C, D & E are more confusing:

C = the GROSS "income" due to GROSS claims in 2017 *(think of it as **negative** income)*

=	(2017 gross UCAE)	-	(2016 gross UCAE)	+	(gross paid in 2017) *	
=	B	-	*given info*	+	*from paid triangle*	
=	16,514	-	7,200	+	**5,400**	
=	14,714					

(gross paid in 2017)

=	2016 @ 24	-	2016 @ 12	+	2017 @ 12
=	5,400	-	2,300	+	2,300
=	**5,400**				

D = the CEDED "income" due to CEDED claims in 2017 *(this is a **recoverable**)*

=	(2017 ceded UCAE)	-	(2016 ceded UCAE)	+	(ceded paid in 2017) **
=	A	-	*given info*	+	*see below*
=	4,785	-	5,040	+	**1,620**
=	1,365				

(ceded paid in 2017)

=	gross paid in 2017	x	30%
=	5,400	x	30%
=	**1,620**		

E = net "income" due to claims in 2017 *(this is also **negative** income)*

=	C	-	D
=	14,714	-	1,365
=	13,349		

F is easy: **if** you know that the year labels in the **left** column of the table represent **Calendar Years** **and** the year labels in the **top** row represent **Accident Years**

Use the paid loss triangle and the quota-share percentage

F	=	qs%	x	(	AY 2016 paid in CY 2017			)	
	=	70%	x	(	5,400	-	2,300	)	
	=	2,170							

G & H are related: H is the **excess (deficiency) ratio** and G is the **investment income** in the excess (deficiency) formula

You might like to review the practice template for the excess (defiency) ratio before proceding! In any case, we first need to calculate G. Note that UCAE + IBNR are directly from the **Runoff exhibit** in the given info.

G	=	(investment yield) *	x	avg [$(UCAE+IBNR)_{beg\ of\ 17}$, $(UCAE + IBNR)_{end\ of\ 17}$]				
	=	5.76%	x	avg [	5,400	,	4,200	]
	=	276						

**** investment yield***

=	2	x	NII				
/	[$(invested\ assets)_{beg\ of\ 17}$ + $(invested\ assets)_{end\ of\ 17}$ - NII]						
=	2	x	3,000				
/	[	55,200	+	52,000	-	3,000	]
=	**5.76%**						

NII or net investment income comes from the **Income Statement**
invested assets come from the **Balance Sheet**

H	=	[$(UCAE + IBNR)_{AY16\ @\ 12}$ - $(UCAE + IBNR)_{AY16\ @\ 24}$ - $(net\ Pd)_{12-24}$ + G] / $(UCAE + IBNR)_{AY16\ @\ 12}$

Now:

$(UCAE + IBNR)_{AY16\ @\ 12}$	=	2,600	+	2,800	=	5,400
$(UCAE + IBNR)_{AY16\ @\ 24}$	=	1,500	+	2,700	=	4,200
$(net\ Pd)_{12-24}$	=	F			=	2,170

Therefore:

H = -12.8% **<== Excess (Deficiency) Ratio**

J is hard: J is **(gross UEP)$_{17}$** but we can't find that directly. We must first find **(net UEP)$_{17}$**.

Recall the standard formula for EP in terms of WP and UEP:

EP	=	WP	-	chg(UEP)

Apply this to our situation to obtain:

NEP_{17}	=	NWP_{17}	-	[$(net\ UEP)_{17}$ - $(net\ UEP)_{16}$]
30,300	=	32,000	-	[$(net\ UEP)_{17}$ - ($(gross\ UEP)_{16}$ - $(ceded\ UEP)_{16}$)]

Ok, this is getting messy so I'm going to let you do the algebra. Substitute these values above:

$(gross\ UEP)_{16}$	=	6,500	*<== from* ***Page 20.20*** *Balance Sheet*
$(ceded\ UEP)_{16}$	=	4,550	*<== from Page* ***20.10*** *Balance Sheet*

The result is:

$(net\ UEP)_{17}$	=	3,650

And finally, using the **quota-share percentage** to GROSS UP this net value, we obtain:

$(gross\ UEP)_{17}$	=	$(net\ UEP)_{17}$	/	**70%**
J	=	3,650	/	70%
J	=	5,214		

K (finally): K is $(net\ IBNR)_{17\ \&\ prior}$ and the standard formula is IBNR = (Total Liabilities) - Case

$(net\ IBNR)_{17\ \&\ prior}$	=	$(net\ APV)_{17\ \&\ prior}$	-	$(net\ Case)_{17\ \&\ prior}$

where

$(net\ APV)_{17\ \&\ prior}$	=	11,729	***<== from Step 3b***
$(net\ Case)_{17\ \&\ prior}$	=	4,100	***<== from Runoff Exhibit (2017 UCAE for 2017 & prior)***

therefore

K	=	11,729	-	4,100
	=	7,629		

Solution Summary:

A	=	4,785
B	=	16,514
C	=	14,714
D	=	1,365
E	=	13,349

F	=	2,170
G	=	276
H	=	-12.8%
J	=	5,214
K	=	7,629

Paper: CCIR.ARinstr (Alphabet City (Model 18.F Q16)) 08 a-Question
Problem: calculate (A,B,C,D,E,F,G,H,J,K) - there is no "I"
Problem Type: 2018.Fall #16

Balance Sheet

Page 20.10 Asset	2017	2016	
recoverable from reinsurers:			
UEP	n/a	3,010	<== ceded values
UCAE	A	5,670	<== ceded values
total investments including cash	40,100	33,000	

Page 20.20 Liabilities & Equity	2017	2016	
UEP	J	4,300	<== gross values
UCAE	B	8,100	<== gross values

Income Statement

Page 20.30 Statement of Income	2017	2016
NWP	24,000	25,900
NEP	24,400	n/a
GROSS claims & adjustment expenses	C	n/a
REINSURER'S SHARE of claims & adj exps	D	n/a
NET claims & adjustment expenses	E	n/a
NET investment income	2,700	n/a

Runoff

CY	Page 60.41 Net Clms & Adj Exps Runoff Discounted		AY 2016	AY 2017	AY 2017 & prior
2016	UCAE	end of year	1,700		
	IBNR	end of year	2,100		
2017	Paid	*during year*	F	n/a	n/a
	UCAE	end of year	1,200	n/a	3,200
	IBNR	end of year	1,600	n/a	K
	investment income from UCAE & IBNR		G		
	Amount:	*excess/deficiency*	n/a		
	Ratio:	*excess/deficiency*	H		

Bond Portfolio

rating	class	book val.	mkt. val.	duration	yield
govt	HTM	12,000	12,240	0.8	1.1%
AAA	HTM	4,000	3,440	9.0	2.3%
A	HTM	8,000	7,040	2.0	5.0%

Triangle Data

GROSS paid loss (cumulative)

AY	12	24
2016	1,600	5,000
2017	1,700	

GROSS unpaid loss (undiscounted)

AY	12	24
2016	n/a	4,600
2017	5,000	

Payment Pattern *(incremental)*

year 1	10%
year 2	20%
year 3	70%

MfADs

MfAD (claims):	10.00%
MfAD (re):	1.00%
MfAD (inv):	0.75%

* reinsurance quota-share RETENTION ==> **70%**

Step 1: calculate the discount rate as a weighted average of the yields in the bond portfolio

weight *	yield	
9,360	1.1%	
36,000	2.3%	
16,000	5.0%	
	2.82%	<== discount rate

* weight = (book value) x duration

Step 2a: calculate the gross PV for AY 2017 and AY 2016 *(gross of quota-share reinsurance)* at **2.82%**

AY 2017:	unpaid	=	5,000	*(at 12 months)*						
	PV_{17}	=	20%	/	90%	x	5,000	/	1.0282 ^ 0.5	
		+	70%	/	90%	x	5,000	/	1.0282 ^ 1.5	
		=	1,096	+	3,730					
		=	**4,826**							
AY 2016:	unpaid	=	4,600	*(at 24 months)*						
	PV_{16}	=	70%	/	70%	x	4,600	/	1.0282 ^ 0.5	
		=	**4,536**							

==> gross PV for both AYs at: **2.82%** is **9,362**

Step 2b: calculate the gross PV for AY 2017 and AY 2016 *(gross of quota-share reinsurance)* at **2.07%**

==> gross PV for both AYs at: **2.07%** is 9,424 *(similar calculation to Step 1)*

Step 3a:	gross APV	=	9,424	+	10.00%	x	**9,362**	=	**10,360**
Step 3b:	net APV	=	9,424	x	70%				
		+	**9,362**	x	70%	x	10.00%		
		+	9,362	x	30%	x	1.00%		
		=	**7,280**						
Step 3c:	ceded APV	=	10,360	-	7,280	=	**3,080**		

Now we can start filling in the values for the letters:

A & B are very easy: *(B is the net claims **liability** , A is the reinsurance recoverable **asset**)*

A	=	3,080	UCAE recoverable from reinsurer	(Step 3c)
B	=	10,360	gross UCAE liability	(Step 3a)

C, D & E are more confusing:

C = the GROSS "income" due to GROSS claims in 2017 *(think of it as **negative** income)*

=	(2017 gross UCAE)	-	(2016 gross UCAE)	+	(gross paid in 2017) *	
=	B	-	*given info*	+	*from paid triangle*	
=	10,360	-	8,100	+	**5,100**	
=	7,360					

(gross paid in 2017)

=	2016 @ 24	-	2016 @ 12	+	2017 @ 12
=	5,000	-	1,600	+	1,700
=	**5,100**				

D = the CEDED "income" due to CEDED claims in 2017 *(this is a **recoverable**)*

=	(2017 ceded UCAE)	-	(2016 ceded UCAE)	+	(ceded paid in 2017) **
=	A	-	*given info*	+	*see below*
=	3,080	-	5,670	+	**1,530**
=	-1,060				

(ceded paid in 2017)

=	gross paid in 2017	x	30%
=	5,100	x	30%
=	**1,530**		

E = net "income" due to claims in 2017 *(this is also **negative** income)*

=	C	-	D
=	7,360	-	-1,060
=	8,420		

F is easy: **if** you know that the year labels in the **left** column of the table represent **Calendar Years** **and** the year labels in the **top** row represent **Accident Years**

Use the paid loss triangle and the quota-share percentage

F	=	qs%	x	(	AY 2016 paid in CY 2017	)
	=	70%	x	(	5,000 - 1,600	)
	=	2,380				

G & H are related: H is the **excess (deficiency) ratio** and G is the **investment income** in the excess (deficiency) formula

You might like to review the practice template for the excess (defiency) ratio before proceding! In any case, we first need to calculate G. Note that UCAE + IBNR are directly from the **Runoff exhibit** in the given info.

G	=	(investment yield) *	x	avg [$(UCAE+IBNR)_{beg\ of\ 17}$, $(UCAE + IBNR)_{end\ of\ 17}$]
	=	7.67%	x	avg [3,800 , 2,800]
	=	253		

**** investment yield***

	=	2	x	NII			
	/	[$(invested\ assets)_{beg\ of\ 17}$ + $(invested\ assets)_{end\ of\ 17}$ - NII]					
	=	2	x	2,700			
	/	[	40,100	+	33,000	-	2,700]
	=	**7.67%**					

NII or net investment income comes from the **Income Statement**
invested assets come from the **Balance Sheet**

H	=	[$(UCAE + IBNR)_{AY16\ @\ 12}$ - $(UCAE + IBNR)_{AY16\ @\ 24}$ - $(net\ Pd)_{12-24}$ + G] / $(UCAE + IBNR)_{AY16\ @\ 12}$

Now:

$(UCAE + IBNR)_{AY16\ @\ 12}$	=	1,700	+	2,100	=	3,800
$(UCAE + IBNR)_{AY16\ @\ 24}$	=	1,200	+	1,600	=	2,800
$(net\ Pd)_{12-24}$	=	F			=	2,380

Therefore:

H = -29.7% **<== Excess (Deficiency) Ratio**

J is hard: J is **(gross UEP)$_{17}$** but we can't find that directly. We must first find **(net UEP)$_{17}$**.

Recall the standard formula for EP in terms of WP and UEP:

EP	=	WP	-	chg(UEP)

Apply this to our situation to obtain:

NEP_{17}	=	NWP_{17}	-	[$(net\ UEP)_{17}$ - $(net\ UEP)_{16}$]
24,400	=	24,000	-	[$(net\ UEP)_{17}$ - ($(gross\ UEP)_{16}$ - $(ceded\ UEP)_{16}$)]

Ok, this is getting messy so I'm going to let you do the algebra. Substitute these values above:

$(gross\ UEP)_{16}$	=	4,300	*<== from* ***Page 20.20*** *Balance Sheet*
$(ceded\ UEP)_{16}$	=	3,010	*<== from Page* ***20.10*** *Balance Sheet*

The result is:

$(net\ UEP)_{17}$	=	890

And finally, using the **quota-share percentage** to GROSS UP this net value, we obtain:

$(gross\ UEP)_{17}$	=	$(net\ UEP)_{17}$	/	**70%**
J	=	890	/	70%
J	=	1,271		

K (finally): K is $(net\ IBNR)_{17\ \&\ prior}$ and the standard formula is IBNR = (Total Liabilities) - Case

$(net\ IBNR)_{17\ \&\ prior}$	=	$(net\ APV)_{17\ \&\ prior}$	-	$(net\ Case)_{17\ \&\ prior}$

where

$(net\ APV)_{17\ \&\ prior}$	=	7,280	***<== from Step 3b***
$(net\ Case)_{17\ \&\ prior}$	=	3,200	***<== from Runoff Exhibit (2017 UCAE for 2017 & prior)***

therefore

K	=	7,280	-	3,200
	=	4,080		

Solution Summary:

A	=	3,080
B	=	10,360
C	=	7,360
D	=	-1,060
E	=	8,420

F	=	2,380
G	=	253
H	=	-29.7%
J	=	1,271
K	=	4,080