IMPORTANT FEATURES AND TIPS FROM 2UG EXAM HISTORY

- *MS-F2 Investments* is a Year 12 Standard 1 topic. It is comprised of the compound interest content found in Standard 2 and notably omits the content associated with shares and dividends.

ANALYSIS - What to Expect and Common pitfalls

- *Compound Interest has* consistently caused problems in past Gen2 exams, particularly with questions involving *Compounded Value of $1* tables. Asked 5 times in the last 8 years with sub-50% mean marks on 4 occasions. A clear revision focus area.

- Examiners have required students to use the $FV = PV(1 + r)^n$ formula in 2014/15/17 with allocations of between 1-3 marks. A regularly tested topic area that we expect to appear even more regularly in Standard 1 exams than it has in past Gen2 papers!

- All questions covering shares and dividends have been removed as they are beyond the scope of the Standard 1 course.

Questions

1. Financial Maths, 2UG 2009 HSC 6 MC

   ⚠ *RAP Data - Bottom 3%: School result (80%) was -3% below state average (83%)*

   A house was purchased in 1984 for $35 000. Assume that the value of the house has increased by 3% per annum since then.

   Which expression gives the value of the house in **2009**?

   (A) $35\,000(1 + 0.03)^{25}$

   (B) $35\,000(1 + 3)^{25}$

   (C) $35\,000 \times 25 \times 0.03$

   (D) $35\,000 \times 25 \times 3$

2. Financial Maths, 2UG 2015 HSC 17 MC

   What amount must be invested now at 4% per annum, compounded quarterly, so that in five years it will have grown to $60 000?

   (A) $8919

   (B) $11 156

   (C) $49 173

   (D) $49 316

3. Financial Maths, 2UG 2016 HSC 8 MC

The table shows the future value of an investment of $1000, compounding yearly, at varying interest rates for different periods of time.

Future values of an investment of $1000

Number of years	Interest rate per annum				
	1%	*2%*	*3%*	*4%*	*5%*
1	1010.00	1020.00	1030.00	1040.00	1050.00
2	1020.10	1040.40	1060.90	1081.60	1102.50
3	1030.30	1061.21	1092.73	1124.86	1157.63
4	1040.60	1082.43	1125.51	1169.86	1215.51
5	1051.01	1104.08	1159.27	1216.65	1276.28

Based on the information provided, what is the future value of an investment of $2500 over 3 years at 4% pa?

(A) $1124.86

(B) $2812.15

(C) $3624.86

(D) $5312.15

4. Financial Maths, 2UG 2017 HSC 10 MC

A single amount of $10 000 is invested for 4 years, earning interest at the rate of 3% per annum, compounded monthly.

Which expression will give the future value of the investment?

A. $10\,000 \times (1 + 0.03)^4$

B. $10\,000 \times (1 + 0.03)^{48}$

C. $10\,000 \times \left(1 + \dfrac{0.03}{12}\right)^4$

D. $10\,000 \times \left(1 + \dfrac{0.03}{12}\right)^{48}$

5. Financial Maths, 2UG 2012 HSC 9 MC

Tracy invests some money for 2 years at 4% per annum, compounded quarterly.

Compounded values of $1

Period	Interest rate per period				
	1%	*2%*	*3%*	*4%*	*5%*
1	1.010	1.020	1.030	1.040	1.050
2	1.020	1.040	1.061	1.082	1.103
3	1.030	1.061	1.093	1.125	1.158
4	1.041	1.082	1.126	1.170	1.216
5	1.051	1.104	1.159	1.217	1.276
6	1.062	1.126	1.194	1.265	1.340
7	1.072	1.149	1.230	1.316	1.407
8	1.083	1.172	1.267	1.369	1.477

Which figure from the table should Tracy use to calculate the value of her investment at the end of 2 years?

(A) 1.020

(B) 1.082

(C) 1.083

(D) 1.369

6. Financial Maths, 2UG 2018 HSC 19 MC

The table shows the compounded values of $1 at different interest rates over different periods.

Compounded values of $1

| Number of periods	Interest rate per period				
	1%	2%	3%	4%	5%
2	1.0201	1.0404	1.0609	1.0816	1.1025
4	1.0406	1.0824	1.1255	1.1699	1.2155
6	1.0615	1.1262	1.1941	1.2653	1.3401
8	1.0829	1.1717	1.2668	1.3686	1.4775
10	1.1046	1.2190	1.3439	1.4802	1.6289
12	1.1268	1.2682	1.4258	1.6010	1.7959

Amy hopes to have $21 000 in 2 years to buy a car. She opens an account today which pays interest of 4% pa, compounded quarterly.

Using the table, which expression calculates the minimum single sum that Amy needs to invest today to ensure she reaches her savings goal?

A. 21 000 × 1.0816

B. 21 000 ÷ 1.0816

C. 21 000 × 1.0829

D. 21 000 ÷ 1.0829

7. Financial Maths, 2UG 2007 HSC 23a

Lilly and Rose each have money to invest and choose different investment accounts.

The graph shows the values of their investments over time.

Value of investments
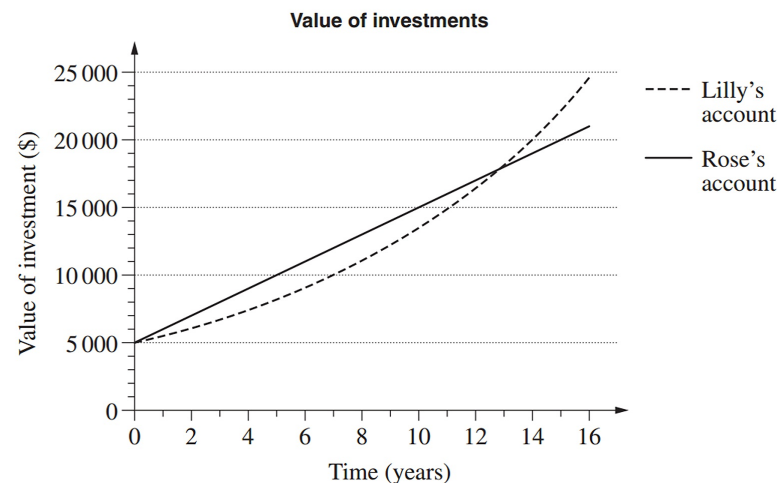
(i) How much was Rose's original investment? *(1 mark)*

(ii) At the end of 6 years, which investment will be worth the most and by how much? *(2 marks)*

(iii) Lilly's investment will reach a value of $20 000 first.

How much longer will it take Rose's investment to reach a value of $20 000? *(1 mark)*

8. Financial Maths, 2UG 2008 HSC 24c

Heidi's funds in a superannuation scheme have a future value of $740 000 in 20 years time. The interest rate is 4% per annum and earnings are calculated six-monthly.

What single amount could be invested now to produce the same result over the same period of time at the same interest rate? *(3 marks)*

9. Financial Maths, 2UG 2015 HSC 26d

A family currently pays $320 for some groceries.

Assuming a constant annual inflation rate of 2.9%, calculate how much would be paid for the same groceries in 5 years' time. *(2 marks)*

10. Financial Maths, 2UG 2014 HSC 30a

Chandra and Sascha plan to have $20 000 in an investment account in 15 years time for their grandchild's university fees.

The interest rate for the investment account will be fixed at 3% per annum compounded monthly.

Calculate the amount that they will need to deposit into the account now in order to achieve their plan.   *(3 marks)*

11. Financial Maths, 2UG 2011 HSC 23c

An amount of $5000 is invested at 10% per annum, compounded six-monthly.

Compounded values of $1

Period	Interest rate per period				
	1%	5%	10%	15%	20%
1	1.010	1.050	1.100	1.150	1.200
2	1.020	1.103	1.210	1.323	1.440
3	1.030	1.158	1.331	1.521	1.728
4	1.041	1.216	1.464	1.750	2.074
5	1.051	1.276	1.611	2.011	2.488
6	1.062	1.340	1.772	2.313	2.986

Use the table to find the value of this investment at the end of three years.   *(2 marks)*

12. Financial Maths, 2UG 2013 HSC 26e

Kimberley has invested $3500.

Interest is compounded half-yearly at a rate of 2% per half-year.

Compounded values of $1

Period	Interest rate per period					
	1%	2%	3%	4%	5%	6%
1	1.010	1.02	1.03	1.04	1.05	1.06
2	1.020	1.040	1.061	1.082	1.103	1.124
3	1.030	1.061	1.093	1.125	1.158	1.191
4	1.041	1.082	1.126	1.170	1.216	1.262
5	1.051	1.104	1.159	1.217	1.276	1.338
6	1.062	1.126	1.194	1.265	1.340	1.419
7	1.072	1.149	1.230	1.316	1.407	1.504
8	1.083	1.172	1.267	1.369	1.477	1.594

Use the table to calculate the value of her investment at the end of 4 years.   *(2 marks)*

Worked Solutions

1. Financial Maths, 2UG 2009 HSC 6 MC

   $r = 3\% = 0.03$

   $n = 25$ years

   Using $FV = PV(1 + r)^n$

   $\therefore$ Value in 2009 $= 35\,000(1 + 0.03)^{25}$

   $\Rightarrow A$

2. Financial Maths, 2UG 2015 HSC 17 MC

   Using $FV = PV(1 + r)^n$

   $r = \dfrac{4\%}{4} = 1\% = 0.01$ per quarter

   $n = 5 \times 4 = 20$ quarters

   $60\,000 = PV(1 + 0.01)^{20}$

   $\therefore PV = \dfrac{60\,000}{1.01^{20}}$

   $= \$49\,172.66\ldots$

   $\Rightarrow C$

3. Financial Maths, 2UG 2016 HSC 8 MC

   Table factor $= 1124.86$

   $\therefore FV = 2.5 \times 1124.86$

   $= \$2812.15$

   $\Rightarrow B$

4. Financial Maths, 2UG 2017 HSC 10 MC

   Compounding rate $= \dfrac{3}{100} \div 12$

   $= \dfrac{0.03}{12}$

   Compounding periods $= 4 \times 12 = 48$

   $\therefore FV = 10\,000 \times \left(1 + \dfrac{0.03}{12}\right)^{48}$

   D

5. Financial Maths, 2UG 2012 HSC 9 MC

   4% annual

   $\Rightarrow \dfrac{4\%}{4} = 1\%$ compounded each quarter

   $\Rightarrow n = 8$ (8 quarters in 2 years)

   $\therefore$ Factor $= 1.083$ (from table)

   $\Rightarrow C$

   ◆◆◆ *Mean mark 24%. The lowest MC mean mark in the 2012 exam.*
   COMMENT: A process to follow: 1-convert the annual rate to the rate per compounding period. 2-calculate the number of compounding periods.

6. Financial Maths, 2UG 2018 HSC 19 MC

   4% annual

   $\Rightarrow \dfrac{4\,\%}{4} = 1\%$ compounded quarterly

   $\Rightarrow n = 8$

   $\Rightarrow$ Factor $= 1.0829$

   $\therefore$ Minimum sum $= 21\,000 \div 1.0829$

   $\Rightarrow D$

   ◆◆ *Mean mark 33%.*

7. Financial Maths, 2UG 2007 HSC 23a

(i) $5000 ($y$-intercept)

(ii) After 6 years,

Lilly's investment = $9000

Rose's investment = $11 000

∴ Rose's is worth $2000 more.

(iii) It takes Lilly 14 years to reach $20 000 and it takes Rose 1 year longer (15 years) to reach the same value.

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8. Financial Maths, 2UG 2008 HSC 24c

$$FV = PV(1+r)^n$$

$$740\,000 = PV\left(1 + \frac{2}{100}\right)^{40}$$

$$\therefore PV = \frac{740\,000}{(1.02)^{40}}$$

$$= 335\,138.907\ldots$$

$$= \$335\,138.91$$

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9. Financial Maths, 2UG 2015 HSC 26d

$$FV = PV(1+r)^n$$

$$= 320(1.029)^5$$

$$= \$369.1703\ldots$$

$$= \$369.17 \ (\text{nearest cent})$$

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10. Financial Maths, 2UG 2014 HSC 30a

$$FV = \$20\,000, \quad n = 15 \times 12 = 180,$$

$$r = \frac{0.03}{12} = 0.0025$$

$$FV = PV(1+r)^n$$

$$20\,000 = PV(1 + 0.0025)^{180}$$

$$PV = \frac{20\,000}{(1.0025)^{180}}$$

$$= 12\,759.73\ldots$$

∴ They need to deposit $12 760 (nearest $)

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11. Financial Maths, 2UG 2011 HSC 23c

Interest rate = 10% pa = 5% per 6 months

Period = 6 (6 x 6 months in 3 years)

⇒ Table value = 1.340

∴ Value of investment = 5000 × 1.34

$$= \$6700$$

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12. Financial Maths, 2UG 2013 HSC 26e

$r = 2\%$ per half-year

$n = 8$ (8 half-years in 4 years)

⇒ Table Factor = 1.172

Investment = 3500 × 1.172

$$= \$4102$$

∴ After 4 years, investment value is $4102