

WJEC Higher AER PPQs

1.

A building society is advertising the following savings scheme.

SUPER SAVER

Interest rate: 6% per annum
Interest is paid to you every 4 months

The building society must tell customers what the Annual Equivalent Rate (AER) is on this savings scheme.

The formula used to calculate this AER is

$$\text{AER} = \left[\left(1 + \frac{R}{100N} \right)^N - 1 \right] \times 100$$

Where R is the percentage interest rate per annum shown in the advert,
and N is the number of interest payments you receive in one year.

Calculate the AER on this Super Saver scheme.
Give your answer correct to 2 decimal places.

[3]

This image shows a full page of white paper with ten horizontal dashed lines, typical of primary school handwriting practice paper. The lines are evenly spaced and extend across the entire width of the page. There is no text or other markings on the paper.

2.

Adam is interested in opening a savings account at Morris Bank. The manager of Morris Bank explains to Adam that they have two different savings accounts. Some details of the accounts are shown below.

Account	Nominal interest rate	AER Annual Equivalent Rate, correct to 2 decimal places
Quarter Back	8.6% p.a., paid quarterly%
Monthly Goal	5.4% p.a., paid monthly	5.54%

- (a) (i) In the table above, complete the AER column in the table for the Quarter Back account using the information given below.

AER, as a decimal, is calculated using the formula $(1 + \frac{i}{n})^n - 1$, where i is the nominal interest rate per annum as a decimal and n is the number of compounding periods per annum.

[5]

- (ii) Explain why AER is used by the bank.

[1]

- (b) Adam decides to invest £350 in the Monthly Goal account for 3 years.
The account pays an AER rate of 5.54% p.a.
Will Adam have sufficient money in his Monthly Goal account to buy a motor scooter for £410 in 3 years time?
You must show all your working and give a reason for your answer.

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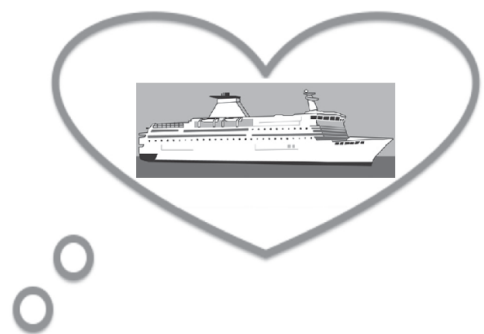
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[4]

3. (a) Bryn is planning to go on a cruise when he retires in 15 years' time.



He has £5600 to invest.
In 15 years' time, he is hoping to have £7000 to spend on the retirement cruise.
He has noticed an advertisement for a savings account paying 1.85% AER.

By investing his £5600 in the savings account for 15 years, will Bryn have £7000 to spend on the cruise?
You must show all your working. [4]

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- (b) Nia wants to invest £2000.
Greenash Building Society has a savings account offering 2.18% per annum, with interest paid annually.
Downtown Building Society has a savings account offering 2.15% per annum, with interest paid monthly.

$$\text{AER \%} = 100 \left(1 + \frac{r}{100n} \right)^n - 100$$

where

n is the number of times per year that interest is paid

r is the gross interest rate as a percentage

By comparing AERs, advise which account will offer Nia the better interest on her investment.

You must show all your working.

[5]

[illegible]

4.

(a)

Account	AER Annual Equivalent Rate
<i>Eagle Saver</i>	5.2%

Cledwyn has been given £450.
He decides to invest £450 in the *Eagle Saver* account for 4 years.
The *Eagle Saver* account pays an AER of 5.2% p.a.
Will Cledwyn have sufficient money in his *Eagle Saver* account to be able to buy a television costing £550 in 4 years time?
You must show all your working and give a reason for your answer. [4]

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- (b) Cledwyn is also interested in opening a savings account.
Cledwyn has some details of a *Kite Saver* account.

Account	Nominal interest rate	AER Annual Equivalent Rate, correct to 2 decimal places
<i>Kite Saver</i>	6.8% p.a. paid quarterly %

- (i) Write 6.8% as a decimal. [1]

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- (ii) Would you expect the AER for the *Kite Saver* account to be greater than, equal to, or less than 6.8%?
Tick (✓) one of the boxes below.
Without doing any calculations, give an explanation for your answer. [1]

Greater than 6.8% ☐ Equal to 6.8% ☐ Less than 6.8% ☐

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- (iii) In the table above, complete the AER column, correct to 2 decimal places, for the *Kite Saver* account using the following information.
AER, as a decimal, is calculated using the formula $\left(1 + \frac{i}{n}\right)^n - 1$,
where
 i is the nominal interest rate per annum **as a decimal** and
 n is the number of compounding periods per annum. [4]

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- (iv) Explain why banks use AER. [1]

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5.

- (a) Ffion thinks that if interest is paid monthly then the AER% rate is always higher than the Gross annual % rate.

Explain why Ffion is correct. [1]

- (b) Haygreen Building Society offers customers a range of savings accounts.



- (i) The Gross annual interest rate on the **Mega Plus** savings account is 4.8%, with the interest payable monthly.
Calculate the monthly interest rate payable on the **Mega Plus** savings account. [1]

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- (ii) Ffion decides to open a **Gold** savings account on the 1st May.
The interest is paid at a rate of 0.3% per month.
She invests £200 in the account.
She leaves the account without withdrawing from or making payments into her account for 5 months.
Calculate the balance that would be shown on Ffion's **Gold** savings account statement after this five-month period. [3]

- (iii) Haygreen Building Society has another savings account, **Save & Grow**.
This account allows a fixed amount of money to be invested for a 12-month period.
Withdrawals or further investments are not allowed.
The monthly interest rate is 1.2%.

A spreadsheet is used to calculate the balance on the **Save & Grow** savings account every month.

Gareth invests £400 in a **Save & Grow** savings account.
An example of the spreadsheet used to calculate the balance in Gareth's account each month is shown below.

A	B	C	D	E	F
1	Amount invested £		Monthly interest rate %	Period of investment, x months	Balance after x months
2	400		1.2		
3				1
4				2	
5				3	
6				4	
7				5	
8				6	
9				7	
10				8	
11				9	
12				10	
13				11	
14				12

Write down the formula, using cell references, which could be used to calculate the amount for each of the following cells.

F3

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= [2]

F14

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= [2]

6. (a) *Morleys Building Society* had an account called '*Morley's Gold Account*' which paid 3.24% Gross.
 At that time, the basic rate of tax was 20% and the higher rate of tax was 40%.
 Complete the following table giving your answers correct to 2 decimal places.

	Gross rate	Net rate for basic rate taxpayers	Net rate for higher rate taxpayers
Morley's Gold Account	3.24% % %

[4]

- (b) Alex has £25 000 to invest in a savings account. She has picked up a leaflet in *Freads Building Society*. The information shown below is taken from the leaflet.

Freads Building Society savings account information, updated 04/05/13				
	Term	Interest paid	Minimum	Maximum
Oak savings account	2 years	6 monthly	£500	£100 000
Sycamore savings account	2 years	12 monthly	£1000	£50 000

The building society tells Alex that the *Oak savings account* would pay her 2.3% interest every 6 months, and the *Sycamore savings account* would pay her 4.6% per annum.

- (i) Without calculations, which of these savings accounts would have the greater AER?

You must give a reason for your answer.

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[1]

- (ii) Alex decides to invest her £25 000 for two years.
Calculate the difference between the interest she would receive if she selected to invest in the *Oak savings account* rather than the *Sycamore savings account*.
Show all your working.

[illegible]

[6]

Marking Scheme

1.

10.	Use of $R = 6$ AND $N = 3$ $\left[\left(1 + \frac{6}{100 \times 3} \right)^3 - 1 \right] \times 100$ (AER =) 6.12 (%)	B1 M1 A1	Allow FT for $N = 4$ only. $N = 4$ leads to an answer of 6.14 (%)
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2.

12.(a)(i) Use of $i = 0.086$ Use of $n = 4$ $(1 + 0.086/4)^4 - 1$ AER 8.88(%)	B1 B1 M1 A2	Correct substitution in the formula given A1 for 0.088(813467.....) or incorrect rounding or truncation of the AER percentage Accept 'percentage of interest paid annually', must mention 'year' or 'annual'
(ii) Explanation, based on need for fair comparison of interest rates	E1	
(b) $5.54/100 \times 350$ or 0.0554×350 $(1 + 0.0554)^3 \times 350$	B1 M1	May be embedded in further calculation Method of adding on different amounts, 3 year period, following attempts to calculate 5.54% ($350 + 19.39 = 369.39$ $369.39 + 20.46(42...) = 389.85(42..)$ $389.85 + 21.597.. =)$ Accept 411.44(7..)) <i>B1 and SC1 for depreciation 294.99, but no FT</i>
(£) 411.45(21...)	A1	
Conclusion, e.g. Yes as more than £410	E1 10	Accept 5.4% monthly used instead to give an answer of 411.40(15..) FT from their compounded amount provided M1, and FT from simple interest for an answer of 408.17 (408.12 from monthly) being < than 410

3.

9(a) b) $5600 \times 1.85/100$ or $5600 \times 0.0185 (= 103.60)$ $(1 + 0.0185)^{15} \times 5600$ (£) 7372(.308954...)	B1 M1 A1	May be embedded in further calculation OR sight of a full cumulative method for at least 13 years Accept correct evaluation from at least 13 years cumulative (e.g. 13 years gives (£)7106(8..) to (£)7107) <i>B1 and SC1 for depreciation 4231.97..., but no FT</i>
Conclusion, e.g. 'Yes (he will have more than he needs)'	E1	FT interpretation provided B1 and M1 awarded <i>If M0 awarded and simple interest used with interest shown or implied as over (£)1400 for 14 or 15 years award SC1 or with conclusion 'Yes' award SC2.</i> <i>If also stated that using compound interest the amount will be greater award SC3</i>
(b) (AER% =) $100 \left(1 + \frac{2.15}{100 \times 12} \right)^{12} - 100$ OR $100(1 + 2.15 \div (100 \times 12))^{12} - 100 = 2.17(.....\%)$	B4	For B4 condone missing brackets in the denominator if the answer correct. Award B3 for correct formula (including brackets in the denominator) but incorrect answer between 1 and 5 inclusive. Award B2 for correct formula and answer not between 1 and 5. Award B1 for one error in the formula e.g. missing brackets, 2000 not 100, a 12 missing, 0.0215 used.
Advise, e.g. 'Greenash as more interest (at 2.18%p.a.)'	E1 9	FT their appropriate interpretation provided at least B2 awarded and APR for Greenash is 2.18%.

4.

11(a) $5.2/100 \times 450$ or 0.052×450 or $23.4(0)$ $(1 + 0.052)^4 \times 450$	B1 M1	May be embedded in further calculation Method of adding on different amounts, 4 year period, following attempts to calculate 5.2% Example of working without truncation or rounding: $(450 + 23.4(0) = 473.4(0)$ $473.4(0) + 24.6168 = 498.0168, 498.01 \text{ or } 498.02$ $498.0168 + 25.8968736 = 523.9136736$ $523.9136736 + 27.24351.. = 551.15718...$ Accept 551.15(7....) B1 and SC1 for depreciation 363.45(099..), but no FT for a conclusion Simple interest answer of 543.6(0) is awarded only the B1
(£) 551.16	A1	
Conclusion, e.g. 'Yes as more than £550'	E1	FT from their compounded amount provided M1, and FT from simple interest from an answer of 543.6(0) being < 550
(b)(i) 0.068	B1	CAO
(ii) Greater AND a reason, e.g. 'interest is accumulated through the year (each three months)'	E1	
(iii) Use of $n = 4$ $(1 + 0.068/4)^4 - 1$ AER 6.98(%)	B1 M1 A2	Correct substitution in the formula given A1 for 0.06975373... rounded or truncated, or incorrect rounding or truncation of the AER percentage. Mark final answer (box takes priority)
(iv) Explanation, based on need for fair comparison of interest rates	E1 11	Allow 'percentage of interest paid annually', must mention 'year' or 'annual'

5.

10(a) Explains that 'interest is compounded'	E1	
(b)(i) $(4.8 \div 12 =)$ 0.4%	B1	
(ii) 200×1.003^5	M1	
(£)203.02 or (£)203.01	A2	A1 for (£)203.01805... or 203 from compound working <i>Alternative method</i> B1 for a correct 0.3% but not 3% M1 For the overall method (5 stages of adding <u>different</u> 0.3%). Accept inappropriate rounding or truncation for M1 only, A0 (Calculation: $\begin{array}{r} 200 \\ 0.60 \\ \hline 200.60 \\ 0.60(18) \\ \hline 201.20(18) \\ 0.60(36054) \\ \hline 201.805405 \\ 0.60541622 \\ \hline 202.410821 \\ 0.60723246 \\ \hline 203.018053 \end{array}$)
(iii)(F3=) $(1 + D2 \div 100) \times B2$ or $B2 \times D2 \div 100 + B2$ or equivalent	B2	Do not ignore subsequent working, penalise - 1 If no marks, then SC1 for Simple Interest (£)203.00 <u>Accept / for division, * for multiplication and ^ for index</u> B1 for evidence of $D2 \div 100$, or $D2 \times B2$, or $1.012 \times B2$, or 1.012×400 or equivalent B0 for 404.8(0)
(F14=) $(1 + D2 \div 100)^{12} \times B2$ or equivalent	B2	Accept cell E14 for indication of '12'. B1 for sight of power 12 linked to cell D2, or for $(1 + D2 \div 100)^x \times B2$, or $(1 + D2/100)^{12} \times B2$, or $(1 + D2/100)^{E14} \times B2$, or equivalent
	9	or for their formula for F3 with appropriate index provided equivalent difficulty

6.

12(a) 3.24×0.8 OR 3.24×0.60 2.59(%) AND 1.94(%)	M1 A3	Or other complete method A2 for 2.59(2) AND 1.94(4) A1 for either 2.59(2) OR 1.94(4) <i>If no marks SC1 for sight of digits</i> 2592 and 1944 (incorrect place value), OR for 0.65 and 1.3(0)
(b)(i) Oak AND a reason showing understand of AER	E1	Reason must say about comparing annually Accept 'Oak, because they give more interest (annually)'
(ii) Oak (Total amount after 2 years = $\pounds 25000 \times 1.023^4$)	M2	Or for alternative complete method compounding 4 times, or M1 for $2.3\% \times 25000$ (= $\pounds 575$)
(Total amount $\pounds 27380.57(37\dots)$) OR (Interest $\pounds 2380.57(3696\dots)$)	A1	Do not accept other rounding or truncation
Sycamore (Total amount after 2 years = $\pounds 25000 \times 1.046^2$)	M1	Or alternative complete method
(Total amount $\pounds 27352.9(0)$) OR (Interest $\pounds 2352.9(0)$)	A1	Do not accept other rounding or truncation
(Difference in interest is $\pounds 27.67$)	B1	FT provided M mark(s) for Oak or Sycamore awarded, with all this answer to nearest penny
	11	