Actuarial Society of South Africa

EXAMINATION

May / June 2019

Subject N211 — Communications

EXAMINERS' REPORT

This subject report has been written with the aim of helping candidates. This report summarises the main points that the examiners were looking for and some common problems encountered.

The examination required the candidates to draft

1. An email to a friend recommending one of two loan options
2. A presentation to high school children to encourage them to take mathematics

QUESTION 1 - Email

Candidates were presented with an email from a friend and details of two loan options that a bank had offered him. One loan was offered on a guaranteed fixed interest basis while the other was on a variable interest basis linked to the prime interest rate.

The question required candidates to compare the two loans on the following aspects:
- The features of the two loans
- The interest cost of the two loans
- The interest rate risk of the two loans
- How the two loans might match the friends needs
- Any other advantages or disadvantages of one loan over the other

In concluding the email the friend should have a clear recommendation of which loan to take and understand why that option is the better of the two for him.

In general candidates identified the main features of the two loans well. Marks were lost however by not covering all the relevant information provided in the question. Candidates often focus only on the differenced and neglect the features that are the same, even basic information such as the amount borrowed. Information such as the timing of when interest accrues and when repayments are due was the most common feature omitted. Very few candidates made use of a visual aid such as a table to present this comparison of features.

While the majority of candidates were able to calculate the interest cost of the two loans and show the repayments due, only a few were able to explain why the interest cost of the loan with the higher interest rate was lower than that on the loan with the lower interest rate. Only half of the candidates were able to correctly calculate the interest earned on investing the difference between the loan repayments and conclude that the fixed interest loan was the cheaper option on a net interest cost basis.

With regard to interest rate risk, most candidates identified the risk of an increase in the variable interest rate loan, but didn't confirm the certainty of the repayment obligations under the fixed interest loan or consider that the prime interest rate could decrease.

The matching of the loan to the business needs only carried a few marks, but only a few candidates got these marks by linking the interest rate risk to the friends desire not to take on any additional risk.

The understanding, calculation and communication around the early settlement option on the fixed interest option and there cost thereof were poorly dealt with by most candidates.

Some candidates made the incorrect recommendation or failed to make a recommendation as required even though the fixed interest loan was the better option on all the criteria considered.

A key communication skill in answering this question was being able to support the recommendation within the word count limit without compromising the explanation.

QUESTION 2 - Presentation

This question required the candidates to present a mathematical problem solving story to high school students. The purpose of the presentation was to persuade students to study mathematics and pursue mathematical careers by illustrating how a large problem was solved with mathematical thinking and limited tools in ancient times.

All the information necessary for telling the story was presented in the question. The information was not of a technical actuarial nature, but rather required application of some high school geometry. The relevant theorems and a graphical illustration of the calculation were provided.

Most candidates were able to state the problem; however marks were lost by not covering all the input information necessary to perform the calculation. The information was available in the question but candidates omitted to relay this back to the students. Without this input information it was difficult to ground an explanation of the solution.

The model for calculating the result was in general adequately described, but more could have done with illustrations to communicate the model.

Half of the candidates were unable to perform the calculation, which given that the model was described, indicated a lack of understanding of the model. While the calculation itself carried only a few marks it was difficult to comment on the accuracy or where the solution could have gone wrong without getting the calculation correct.

Many candidates in concluding forgot the purpose of the presentation and failed to link the story to the roles that the audience could play in solving future problems with mathematics.

A key communication skill in answering this question was understanding the audience and keeping the purpose of the presentation in mind throughout.

Sample Answer – Question 1

To: robertj@gmail.com

From: me@mynet.com

Date: 18 March 2019

Subject: Help with your loan decision

Hi Robert

Your new business adventure sounds exciting. Congrats on getting the loan approved, it's a big step completed.

I've looked at the two loan options and I recommend that you take the fixed interest option. Let me explain.

Loan Features

Here are the most important features:

	Option 1 Fixed Interest	Option 2 Variable Interest
Capital Amount	R500 000	R500 000
Loan Term	5 years	5 years
Interest Rate	14.50% per year	12.25% per year
Interest Rate Type	Fixed for term	Variable: can increase or decrease if prime interest rate changes
Interest Payments	End of each year	End of each year
Capital Repayments	End of each year	End of the term
Early settlement charge	1.5% of the amount settled early for each year that it is repaid early	Early settlement is not allowed

Interest Cost

The interest rate charged on the fixed interest loan is higher than that of the variable interest rate loan. The interest is, however, only charged on the capital amount that you haven't paid back yet. On the fixed interest loan, you pay back some capital each year and this reduces your total interest cost.

	Fixed Interest			Variable Interest	
Year	Payment Due	Interest	Year	Payment Due	Interest
1	R147 396	R72 500	1	R61 250	R61 250
2	R147 396	R61 640	2	R61 250	R61 250
3	R147 396	R49 206	3	R61 250	R61 250
4	R147 396	R34 968	4	R61 250	R61 250
5	R147 396	R18 666	5	R561 250	R61 250
Total	**R736 980**	**R236 980**	**Total**	**R806 250**	**R306 250**

The interest cost of the fixed interest loan is R69 270 lower.

If you took the variable interest loan, you could save the difference between the payments due on both loans. These savings would earn interest of R62 208 over the five years which gives you a net interest cost of R244 042. This is still more than the interest cost of the fixed interest loan.

Interest Rate Risk

The fixed interest rate is fixed for the five years so you know exactly what the loan is going to cost you.

The variable interest rate is uncertain as it is linked to the prime interest rate. If the prime interest rate goes up, then your interest cost increases and if it goes down, your interest cost decreases, making he eventual total interest cost of this option uncertain.

Interest rate indicators show that an increase in interest rates is more likely than a decrease. The variable loan could end up being more expensive than shown here.

Your Business Needs

Your business is new and your cash flows uncertain. A variable interest rate loan introduces more uncertainty, a risk that you want to avoid.

It might seem that the variable interest rate loan offers lower interest-only payments leaving you a buffer for other business cash flows, but this is misleading. You still need to repay the R500 000 at the end of the five-year term so you should be putting something away each year to do so.

Other Costs

The fixed interest loan has an extra charge if you want to settle early. If after the 1st year you want to settle the loan, you will need to pay R25 506, but then no further interest is payable.

You could use the early settlement option if interest rates reduce and a cheaper loan is available. It might be worthwhile to pay the extra charge for the interest saved with a cheaper loan.

The variable interest loan can't be settled early.

Conclusion

The fixed interest loan offers lower cost and risk regarding movement of interest rates and for your business. The early settlement cost isn't important now but could be useful later if circumstances change. Therefore I recommend that you take the fixed interest loan.

Let's chat again before the launch which I'm sure will be highly successful! Well done, my friend!

Cheers

Alex

[650 words]

Sample Answer – Question 2

Solving out-of-this-world problems

Career and Subject Choice Day

My Old High School

18 March 2019

By: Alex Actuary

1

Mathematics

- How big is the earth?
- How to answer this in 220BC
  - The Observations
  - The Theory
- So what's the answer?
- Where could it have gone wrong?
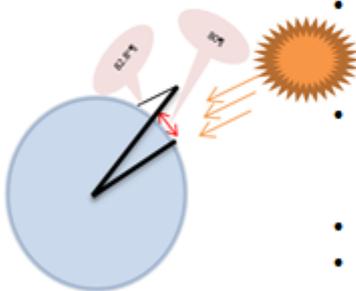- Who cares?

2

How big is the earth?

- Ever wondered how big the earth is?
- We have agreed the earth is round, like a ball, not flat.
- Lets assume the measurement of big means the distance around its widest part.
- It's hard to picture how to measure this.

How to answer this in 220BC

The Observations

- Observations and calculation by Eratosthenes
- A dry well
  - Midsummer's day at noon = no shadow
  - Sun's rays parallel to the well
- Obelisk
  - Midsummer's day at noon = shadow
  - Shadow at 82.8° to the Earth's surface
- Obelisk is 80 schoenus north of the well
- A schoenus is a measure of distance = just more than 10km
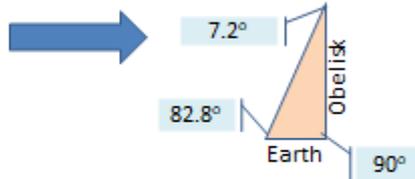- Measured by royal pacers

How to answer this in 220BC

The Theory

Imagine a triangle:
- the shadow, the earth's surface and the obelisk
- Sum of internal angles of a triangle = 180°
- so angle of shadow at top of obelisk = 7.2°

7.2°

82.8°

Obelisk

Earth

90°

- Sun's rays are parallel to each other.
- Ray down the well is parallel to ray making the shadow of the obelisk.
- Imaginary lines down well and from obelisk meet in the centre of the earth making a slice.
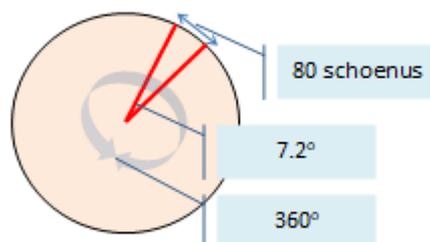
Euclid's theorem: angle of shadow at top of obelisk = angle lines at the centre of the earth make

So angle at centre of earth for our slice = 7.2°

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So what's the answer?

The Calculation

80 schoenus

7.2°

360°

- 360° cut into slices of 7.2° means there are 50 slices.
- Each slice is 80 schoenus.
- So distance around the earth = 80 x 50 = 4 000 schoenus
- Which in today's measurement is 40 000km – 10km to 1 schoenus

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Where could it have gone wrong?

- The accurate measurement of the distance around the earth with today's sophisticated technology is 40 075km.
- Eratosthenes's estimate was very close to correct.
- Royal pacers' measurement may have been inaccurate.
- Conversion of schoenus to kilometres was not exactly 10km to 1 schoenus.
- Measurement of the angles may have been inaccurate.

Who cares?

- Mathematics gives us powerful problem-solving skills.
- What future problems lie ahead that need to be solved?
  - Medical
  - Engineering
  - Financial
  - Ecological
- Without mathematics our abilities are limited.
- You can be part of solving these problems in many different careers.

Any Questions?

Thank you for
attending!

Alex Actuary

If you would like more information on mathematical careers my email address is alex@myemail.co.za