Tutorial Letter 202/1/2018

Basic Numeracy

BNU1501

Semester 1

Department of Decision Sciences

Important information:
Solutions to Assignment 02

Bar code

UNISA university of south africa

Define tomorrow.

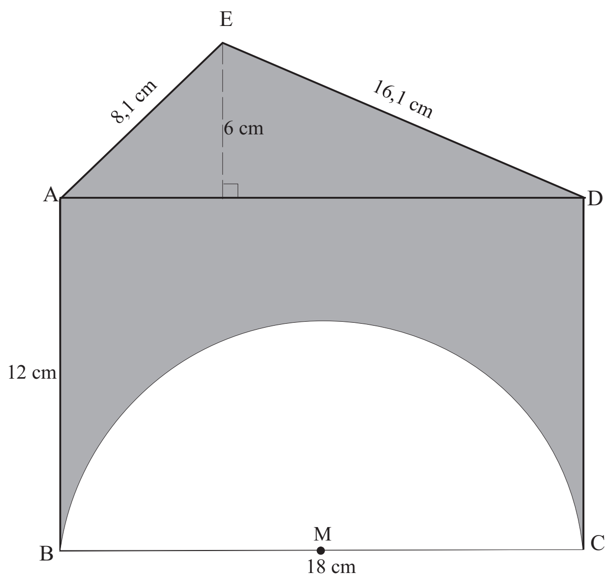
ASSIGNMENT 02: Solutions

Answers

1.	[3]	6.	[3]	11.	[4]	16.	[2]
2.	[2]	7.	[2]	12.	[1]	17.	[3]
3.	[4]	8.	[1]	13.	[1]	18.	[2]
4.	[1]	9.	[3]	14.	[2]	19.	[1]
5.	[4]	10.	[2]	15.	[3]	20.	[4]

Explanations

Question 1



The perimeter of the shaded figure is

$$\begin{aligned} & \left(12 + 8{,}1 + 16{,}1 + 12 + \frac{2\pi r}{2}\right) \text{ cm} \\ = \; & (48{,}200 + \pi(9)) \text{ cm} \\ = \; & 76{,}4743 \text{ cm} \\ \approx \; & 76{,}47 \text{ cm} \end{aligned}$$

The correct option is [3].

Question 2

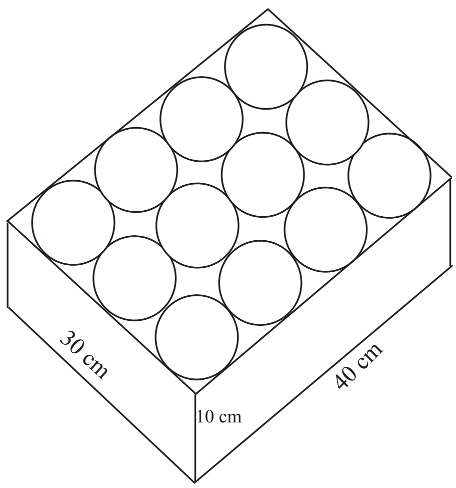
The area of the shaded part of the figure in question 1, is

$$\begin{aligned}
& \text{area of triangle EAD} + \text{area of rectangle ABCD} - \text{area of semi-circle} \\
= & \left(\frac{\text{base} \times \text{height}}{2}\right) + (\text{length} \times \text{width}) - \frac{\pi r^2}{2} \\
= & \left(\frac{18 \times 6}{2}\right) + (18 \times 12) - \left(\frac{\pi.9^2}{2}\right) \\
= & \ 54 + 216 - \frac{254{,}4690}{2} \\
= & \ 142{,}7655 \\
\approx & \ 142{,}77
\end{aligned}$$

Thus the shaded area is 142,77 cm^2.

The correct option is [2].

Question 3



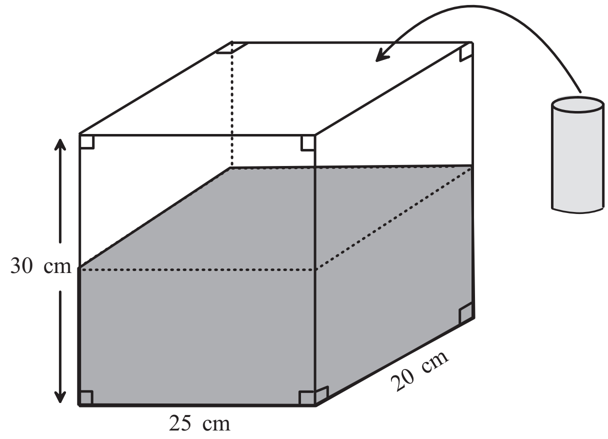
$$\begin{array}{llllll}
\text{The volume of the rectangular box} & = & \ell \times b \times h & = & (40 \times 30 \times 10)\,\text{cm}^3 & = & 12\,000\,\text{cm}^3 \\
\text{The volume of one tin} & = & \pi r^2 h & = & (\pi \times 5 \times 5 \times 10)\,\text{cm}^3 & = & 785{,}3982\,\text{cm}^3
\end{array}$$

The amount of sand necessary is therefore

$$\begin{aligned}
& (12\,000 - 785{,}3982)\,\text{cm}^3 \\
= & \ 2\,575{,}22\,\text{cm}^3 \\
= & \ 2{,}58\,\text{litres} \qquad \text{because } 1\ell = 1\,000\,\text{cm}^3
\end{aligned}$$

The correct option is [4].

Question 4



$$\begin{aligned}\text{The volume of the cylindric piece of iron} &= \pi r^2 h \\ &= \pi(3)^2 10\,\text{cm}^3 \\ &= 282{,}7433\,\text{cm}^3 \quad \text{(Calculator is set up to 4 decimal digits)}\end{aligned}$$

Therefore, the volume of water that the piece of iron replaces is $282{,}7433\,\text{cm}^3$.

Since the water is in a rectangular glass tank, the volume of the replaced water $= \ell \times b \times h$.

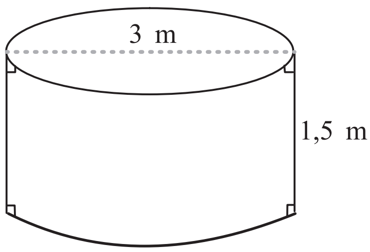
Thus,

$$\begin{aligned} \ell \times b \times h &= 282{,}7433 \\ \text{i.e.} \quad 25 \times 20 \times h &= 282{,}7433 \\ \text{i.e.} \quad h &= \tfrac{282{,}7433}{25\times 20} \\ &= 0{,}5655 \end{aligned}$$

Therefore, the water in the tank will rise with 0,57 cm.

The correct option is [1].

Question 5



The inside area of the fish pond is:

$$\begin{aligned} & \text{the area of circular floor} && + \quad \text{the area of sides} \\ = \; & \pi r^2 && + \quad (2\pi r \times h) \\ = \; & \left[\pi.\left(\tfrac{3}{2}\right)^2\right. && + \quad \left.2\pi\left(\tfrac{3}{2}\right) \times \tfrac{3}{2}\right]\ \text{m}^2 \\ = \; & 21{,}2058\,\text{m}^2 \end{aligned}$$

Now, 1 litre seals $3\,\text{m}^2$ (given).

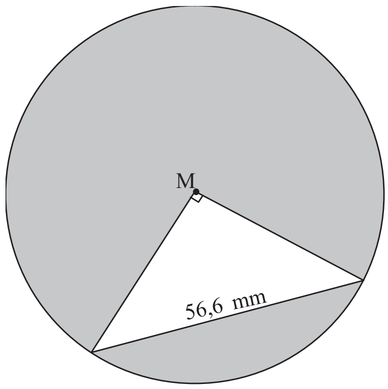
Therefore, $21{,}2058\,\text{m}^2$ will be sealed by

$$\begin{aligned} & \frac{21{,}2058}{3} \text{ litres} \\ = \; & 7{,}068 \text{ litres} \\ = \; & \frac{7{,}0686}{2} \text{ tins} \\ = \; & 3{,}5343 \text{ tins.} \end{aligned}$$

That means that 3,5 tins will be used, but, since we cannot buy parts of tins, 4 two-litre tins have to be purchased.

The correct option is [4].

Question 6



The area of the circle is:

$$\begin{aligned} & \pi r^2 \\ = \; & \pi\,(40)^2 \\ = \; & 5\,026{,}5482\,\text{mm}^2 \qquad \text{(Round off at the final answer.)} \end{aligned}$$

The area of the triangle is:

$$\begin{aligned} & \frac{l \times b}{2} \\ = \; & \frac{40 \times 40}{2}\,\text{mm}^2 \\ = \; & 800\,\text{mm}^2 \end{aligned}$$

Therefore, the area of the shaded region in the diagram

$$\begin{aligned} = \; & \text{area of whole circle} - \text{area of triangle} \\ = \; & (5\,026{,}5482 - 800)\ \text{mm}^2 \\ = \; & 4\,226{,}5482\,\text{mm}^2 \\ = \; & 42{,}3\,\text{cm}^2 \qquad \left(1\,\text{cm}^2 = 10\,\text{mm} \times 10\,\text{mm} = 100\,\text{mm}^2\right) \end{aligned}$$

The correct option is [3].

Question 7

$$\begin{array}{lrcll} & 2(2y-1)-3y & = & 4-y & \\ \text{i.e.} & 4y-2-3y & = & 4-y & \text{(Remove the brackets by multipliplying.)} \\ \text{i.e.} & 4y-3y-2 & = & 4-y & \text{(Re-arrange terms for simplification)} \\ \text{i.e.} & y-2 & = & 4-y & \text{(Simplify left-hand side.)} \\ \text{i.e.} & y-2+y & = & 4-y+y & \text{(Add } y \text{ on both sides to get rid of } y \text{ on the right-hand side.)} \\ \text{i.e.} & 2y-2 & = & 4 & \text{(Simplify both sides.)} \\ \text{i.e.} & 2y & = & 6 & \text{(Simplify both sides.)} \\ \text{i.e.} & \frac{2y}{2} & = & \frac{6}{2} & \text{(Divide by 2 on both sides.)} \\ & & & 3 & \end{array}$$

The correct option is [2].

Question 8

$$\begin{array}{lrcll} & \frac{2x}{5}-\frac{1}{2} & = & \frac{x}{5} & \\ \text{i.e.} & \frac{2x}{5}\times\frac{10}{1}-\frac{1}{2}\times\frac{10}{1} & = & \frac{x}{5}\times\frac{10}{1} & \text{(Multiply with the LCM of the denominators on both sides of the equation to get rid of the fraction.)} \\ \text{i.e.} & 2x\times 2-1\times 5 & = & x\times 2 & \text{(Simplify both sides of the equation.)} \\ \text{i.e.} & 4x-5 & = & 2x & \\ \text{i.e.} & 4x-5+5 & = & 2x+5 & \text{(Add 5 to both sides of the equation.)} \\ \text{i.e.} & 4x & = & 2x+5 & \text{(Simplify where possible.)} \\ \text{i.e.} & 4x-2x & = & 2x-2x+5 & \text{(Subtract } 2x \text{ on both sides.)} \\ \text{i.e.} & 2x & = & 5 & \text{(Simplify both sides.)} \\ \text{i.e.} & \frac{2x}{2} & = & \frac{5}{2} & \text{(Divide by 2 on both sides.)} \\ \text{i.e.} & x & = & \frac{5}{2} & \text{(Simplify where possible.)} \\ \text{i.e.} & x & = & 2\frac{1}{2} & \end{array}$$

The correct option is [1].

Question 9

$$\begin{array}{lrcll} & F & = & \frac{9C}{5}+32 & \\ \text{i.e.} & \frac{9C}{5}+32 & = & F & \text{(Swop the left- and right- hand sides of the equation around.)} \\ \text{i.e.} & \frac{9C}{5}\times\frac{5}{1}+32\times 5 & = & F\times 5 & \text{(Multiply both sides of the equation by 5.)} \\ \text{i.e.} & 9C+160 & = & 5F & \text{(Simplify both sides.)} \\ \text{i.e.} & 9C+160-160 & = & 5F-160 & \text{(Subtract 160 on both sides of the equation.)} \\ \text{i.e.} & 9C & = & 5F-160 & \text{(Simplify where possible.)} \\ \text{i.e.} & \frac{9C}{9} & = & \frac{5F}{9}-\frac{160}{9} & \text{(Divide both sides of the equation by 9.)} \\ \text{i.e.} & C & = & \frac{5F}{9}-\frac{160}{9} & \text{(Simplified on both sides.)} \end{array}$$

The correct option is [3].

Question 10

$$\begin{array}{llcll}
 & V & = & \ell \times b \times h & \\
\text{i.e.} & \ell \times b \times h & = & V & \text{(Swop the left- and right-hand sides around.)} \\
\text{i.e.} & \frac{\ell \times b \times h}{\ell} & = & \frac{V}{\ell} & \text{(Divide both sides of the equation by } \ell\text{.)} \\
\text{i.e.} & b \times h & = & \frac{V}{\ell} & \text{(Simplify both sides.)} \\
\text{i.e.} & \frac{b \times h}{b} & = & \frac{V}{\ell \times b} & \text{(Divide both sides by } b\text{.)} \\
\text{i.e.} & h & = & \frac{V}{\ell \times b} & \text{(Simplify both sides.)}
\end{array}$$

The correct option is [2].

Question 11

We substitute the co-ordinates of the two points $(3; -2)$ and $(5; -6)$, which lie on the straight line, into the following formula:

$$\begin{array}{llcl}
 & \frac{y-y_1}{x-x_1} & = & \frac{y_2-y_1}{x_2-x_1} \quad \text{where } (x_1; y_1) = (3; -2) \text{ and } (x_2; y_2) = (5; -6) \\
\text{i.e.} & \frac{y-(-2)}{x-3} & = & \frac{-6-(-2)}{5-3} \\
\text{i.e.} & \frac{y+2}{x-3} & = & \frac{-6+2}{5-3} \\
\text{i.e.} & \frac{y+2}{x-3} & = & \frac{-\cancel{4}^{2}}{\cancel{2}} \\
\text{i.e.} & \frac{y+2}{x-3} \times \frac{x-3}{1} & = & -\frac{2}{1} \times \frac{x-3}{1} \\
\text{i.e.} & y+2 & = & -2x+6 \\
\text{i.e.} & y+2-2 & = & -2x+6-2 \\
\text{i.e.} & y & = & -2x+4
\end{array}$$

The correct option is [4].

Question 12

The formula for **simple interest** investments is

$$S = P\,(1 + rt)$$

where S is the accumulated amount, P is the principal amount that has been invested, r is the simple interest rate per year and t is the time of the investment.

We want r as the subject of the formula in this case.

Therefore

$$
\begin{aligned}
& S &=& \; P(1+rt) \\
\text{i.e.} \quad & P(1+rt) &=& \; S \\
\text{i.e.} \quad & \tfrac{P(1+rt)}{P} &=& \; \tfrac{S}{P} \\
\text{i.e.} \quad & 1+rt &=& \; \tfrac{S}{P} \\
\text{i.e.} \quad & 1+rt-1 &=& \; \tfrac{S}{P}-1 \\
\text{i.e.} \quad & rt &=& \; \tfrac{S}{P}-1 \\
\text{i.e.} \quad & \tfrac{rt}{t} &=& \; \left(\tfrac{S}{P}-1\right)\div t \\
\text{i.e.} \quad & r &=& \; \left(\tfrac{S}{P}-1\right)\div t \\
\text{i.e.} \quad & r &=& \; \left(\tfrac{12\,859}{8\,350}-1\right)\div 6 \\
\text{i.e.} \quad & r &=& \; 0{,}0900 \qquad \text{(See calculator steps below. Calculator is set to 4 decimal digits.)}
\end{aligned}
$$

The simple interest rate is thus 9% per year.

Calculator steps:

12 859 [÷] 8 350 [−] 1 [=] [÷] 6 [=] or

[(] 12 859 [÷] 8 350 [−] [)] [÷] 6 [=]

The correct option is [1].

Question 13

Since we deal with simple interest again in this question, we have to use the **Simple Interest** formula and change the subject of the formula to P. Therefore, we do the following:

$$
\begin{aligned}
& S &=& \; P(1+rt) \\
\text{i.e.} \quad & P(1+rt) &=& \; S \\
\text{i.e.} \quad & P &=& \; \tfrac{S}{1+rt} \\
\text{i.e.} \quad & P &=& \; \tfrac{10\,000}{1+0{,}0975\times\frac{8}{12}} \qquad \left(9{,}75\% = \tfrac{9{,}75}{100} = 0{,}0975\right) \\
\text{i.e.} \quad & P &=& \; 9389{,}6714\ldots \qquad \text{(See calculator steps below.)}
\end{aligned}
$$

The principal amount that has to be invested, is R9 389,67.

The correct option is [1].

Calculator steps:

10 000 [÷] [(] 1 [+] 0,0975 [×] 8 ÷ 12 [)] [=]

Question 14

Note: In this question we deal with a **compound interest investment**. That means that interest is calculated on interest as well. We can find the answer to a compound interest problem in two ways, either by using the financial keys on the financial calculator or by substituting into the relevant formula.

Method 1: By using the financial keys on the calculator.

Firstly we investigate the question very carefully.

What is given?

(i) The future value, FV, is R20 000.
(ii) The interest rate per year, I/Y, is 15%.
(iii) Interest is compounded every 3 months, that is 4 times per year.
(iv) The term (time) of the investment is 3 years.

What is required?

The present value, PV, of the principle amount that has to be invested.

Steps to follow on the prescribed SHARP financial calculator:

2ndF CA	This is **always** the first step in financial calculations to clear the register.
2ndF P/Y 4 ENT ON/C	This is **always** the second step to register the **number of times per year** that interest is compounded. In this case it is 4 times per year.
± 20 000 FV	**Always** press ± before you enter the **first given value**, which is the FV of R20 000 in this case. (In other questions you may have to enter the present value or the payment first. In those cases you also have to press ± first.)
15 I/Y	The yearly interest rate is 15%.
3 2ndF ×P/Y N	**Always** press these three keys **in this specific order** after the term (in years) has been entered.
COMP PV	Compute COMP the required present value, PV.

12 857,9796 appears on the screen.

Thus, Helen should deposit at least R12 857,98 ≈ R12 858.

The correct option is [2].

Method 2: By substituting into the correct formula.

Since we deal with a **compound interest investment**, we use the following formula:

$$S = P(1+i)^n$$

We have to make P the subject of the formula since the principle to be invested is required, i.e.

$$\begin{aligned} P(1+i)^n &= S \\ \text{i.e.} \quad P &= S \div (1+i)^n \\ &= S \div \left(1 + \frac{0{,}15}{4}\right)^{4t} \\ &= 20\,000 \div \left(1 + \frac{0{,}15}{4}\right)^{4\times 3} \\ &= 12\,857{,}9796 \qquad \text{(Calculator is set to 4 decimal digits.)} \\ &\approx 12\,858 \end{aligned}$$

Ordinary calculator steps:

20 000 [÷] [(] 1 [+] 0,15 [÷] 4 [)] [y^x] 12 [=]

The correct option is [2].

Question 15

Note:

In this question we deal with the **amortisation of a loan**, where an amount has to be paid off in equal payments at equal time intervals (quarters in this case).
Here again, we can use either of two methods.

Method 1: By using the financial keys on the prescribed SHARP calculator.

Note:

The prescribed financial calculator is preprogrammed to assist you in performing financial calculations where **compound interest** is concerned. Make sure you are familiar with the operation of the financial calculator.

[2ndF] [CA]
[2ndF] [P/Y] 4 [ENT] [ON/C]
[±] 2 000 [PMT]
18 [I/Y]
10 [2ndF] [× P/Y] [N]
[COMP] [PV]

36 803,1689 appears on the screen.

Lerato will have to borrow R36 803 from the bank.

The correct option is [3].

Method 2: By substituting into the relevant formula.

The **present value** formula is

$$\begin{aligned} P &= R\left[\frac{(1+i)^n - 1}{i\,(1+i)^n}\right] \\ &= 2\,000\left[\frac{\left(1+\frac{0{,}18}{4}\right)^{4\times 10} - 1}{\frac{0{,}18}{4}\left(1+\frac{0{,}18}{4}\right)^{4\times 10}}\right] \\ &= 36\,803{,}1688 \end{aligned}$$

(Calculator is set to 4 decimal digits - see steps below.)

Ordinary calculator steps:

2 000 [×] [(] [(] [(] 1 [+] 0,18 [÷] 4 [)] [2ndF] [y^x] 40 [−] 1 [)] [÷] [(] 0,18 [÷] 4 [×] [(] 1 [+] 0,18 [÷] 4 [)] [2ndF] [y^x] 40 [)] [)] [=]

The correct option is [3].

Question 16

Note:

In this question we deal with **Compound Interest** again. Therefore we have the option to use the financial keys on the financial calculator to solve the problem, or we can substitute into the relevant formula to find the answer.

Method 1: By using the financial keys on the calculator.

Firstly we investigate the question carefully.

What is given?

(i) The present value, [PV], of the loan is.

$$\begin{aligned} & 125\,000 - 15\% \text{ of } 12\,500 \\ = \;& 125\,000 - \tfrac{15}{100} \times 12\,500 \\ = \;& 125\,000 - 18\,750 \\ = \;& 106\,250 \end{aligned}$$

(ii) The yearly interest rate, [I/Y], is 12,5%.

(iii) The time/period of the loan is 6 years.

(iv) Interest is compounded monthly, that is 12 times per year.

What is required?

The minimum monthly payment, [PMT].

Calculator steps on the prescribed SHARP financial calculator:

2ndF CA
2ndF P/Y 12 ENT ON/C
± 106 250 PV
12,5 I/Y
6 2ndF × P/Y N
COMP PMT

2 104,9377 appears on the screen.

Thus, Sam's minimum monthly payment is R2 104,94.

The correct option is thus [2].

Method 2: By substituting into the relevant formula.

The **present value** formula is:

$$P = R\left[\frac{(1+i)^n - 1}{i\,(+i)^n}\right]$$

We have to make the payment, R, the subject of the formula:

$$\begin{aligned} R &= P \div \left[\frac{(1+i)^n - 1}{i(1+i)^n}\right] \\ &= 106\,250 \div \left[\frac{\left(1+\frac{0,125}{12}\right)^{12\times 6} - 1}{\frac{0,125}{12}\left(1+\frac{0,125}{12}\right)^{72}}\right] \\ &= 2\,104,9377 \qquad \text{(Calculator is set to 4 decimal digits – see steps below.)} \end{aligned}$$

Sam's minimum payment is thus R2 104,94.

Ordinary calculator steps:

106 250 ÷ (((1 + 0,125 ÷ 12) 2ndF y^x 72 − 1) ÷ (0,125 ÷ 12 × (1 + 0,125 ÷ 12) 2ndF y^x 72)) =

2 104,9377 appears on the screen.

The correct option is thus [2].

Question 17

Note:

The only way to deal with **amortisation** questions in BNU1501 is to use the financial keys on the calculator. We do not have a formula in this module to find the amount outstanding (the balance) on the loan after 3 years' payments have been made, that is after $3 \times 12 = 36$ payments have been made. It is not necessary to draw up a long amortisation table to find the outstanding amount at the end of year 3. The financial calculator makes it easy to find it in a few steps.

Financial calculator steps:

Firstly, we have to determine the monthly payment s in question 16 above, and then we can proceed to find the outstanding balance.

2ndF CA
2ndF P/Y 12 ENT ON/C
± 106 250 PV
12,5 I/Y
6 2ndF × P/Y N
COMP PMT

The minimum monthly payment of R2 104,9377 appears on the screen. **Keep it on the calculator unrounded.**

Subsequent steps to find the outstanding balance after 36 payments (made in 3 years) have been done:

AMRT 36 ENT
▼ 36 ENT
▼

A balance of 62 921,0663 appears on the screen.

Therefore, after 3 years' payments have been made in full, that is after 36 payments of R2 104,94 have been made, the outstanding balance is still R62 921,07. (Ignore the – sign on the calculator.)

The correct option is thus [3].

Question 18

Below is the amortisation table for the loan in question 16 above:

Number of payments made (months)	Minimum payment	Outstanding balance	Principal paid off	Interest paid off
		106 250		
1	2 104,94	105 251,83	998,16	1 106,77
2	2 104,94	104 243,27	1 008,56	1 096,37
3	2 104,94	103 224,20	1 019,07	1 085,87
4	2 104,94	102 194,51	1 029,69	1 075,25
5	2 104,94	101 154,10	1 040,41	1 064,53
6	2 104,94	100 102,85	1 051,25	1 053,69
7	2 104,94	99 040,65	1 062,20	1 042,74
⋮	⋮	⋮	⋮	⋮
10	2 104,94	95 787,20	1 095,74	1 009,20
⋮	⋮	⋮	⋮	⋮
12 (1 year)	2 104,94	93 561,36	1 118,69	986,25
⋮	⋮	⋮	⋮	⋮
24 (2 years)	2 104,94	79 192,55	1 266,82	838,12
⋮	⋮	⋮	⋮	⋮
36 (3 year)	2 104,94	62 921,07	1 434,57	670,37
⋮	⋮	⋮	⋮	⋮
42 (3,5 years)	2 104,94	53 994,35	1 526,59	578,34
⋮	⋮	⋮	⋮	⋮
48 (4 years)	2 104,94	44 494,98	1 624,53	480,41
60 (5 years)	2 104,94	23 628,99	1 839,40	265,30
⋮	⋮	⋮	⋮	⋮
72 (6 years)	2 104,94	0 0043	2 083,24	21,70

Note: In the 7th month it is the first time that the principal - paid-off part (1 062,20) of the payment is more than the interest-paid-off part (1 042,74).

The correct option is [2].

Question 19

Note: In this question we deal with a loan that is paid of by **equal payments** made into the loan account at **equal time intervals**.

What is given?

(i) The size of the loan, which is the present value **PV** of the loan, is R(480 000 − 150 000) = R330 000.

(ii) The monthly payment **PMT**, is R8 000.

(iii) The interest rate **I/Y** is 24% per year.

(iv) The interest is compounded monthly, that is 12 times per year.

(v) The size of the loan when it is paid off is the future value **FV** of R0,00.

What is required?

The time **N** it will take to pay the loan off.

Method 1: By using the financial keys on the SHARP EL738FB calculator.

2ndF **CA**
2ndF **P/Y** 12 **ENT** **ON/C**
± 106 250 **PV**
0 **FV**
12,5 **I/Y**
2 500 **PMT**
COMP **N**

56,4198 appears on the screen.

Therefore, Justin will pay the R106 250 loan off in 56,4198 **months**, that is $\frac{56{,}4198}{12} = 4{,}7$ years.

The correct option is [1].

NB! By increasing his monthly payment from R2 104,94 to R2 500, that is with R395,06, Justin pays the loan off in 4,7 years instead of in 6 years (and saves a lot of money/interest).

Method 2: By substituting into the relevant formula.

The relevant formula to use in this case is the **present value** formula

$$P = R\left[\frac{(1+i)^n - 1}{(1+i)^n \cdot i}\right]$$

Since the time, n, is required in this question, we make n the subject of the formula. Therefore, from the formula above we can write

$$\begin{aligned}
\frac{(1+i)^n-1}{(1+i)^n\cdot i} &= \frac{P}{R}\\
\text{i.e.}\quad (1+i)^n-1 &= \frac{P}{R}(1+i)^n\cdot i\\
\text{i.e.}\quad (1+i)^n-\frac{P}{R}(1+i)^n i &= 1\\
\text{i.e.}\quad (1+i)^n\left[1-\frac{P}{R}i\right] &= 1\\
\text{i.e.}\quad (1+i)^n &= \frac{1}{1-\frac{P}{R}i}\\
\text{i.e.}\quad n &= \frac{\log\left[\frac{1}{1-\frac{P}{R}i}\right]}{\log(1+i)} \qquad \text{(See the important note below.)}\\
\text{i.e.}\quad &= \frac{\log\left(\frac{1}{1-\frac{106\,250}{2\,500}\times\frac{0{,}125}{12}}\right)}{\log\left(1+\frac{0{,}125}{12}\right)}\\
&= 56{,}41981598\ \textbf{months} \qquad \text{(See calculator step below.)}\\
&= \frac{56{,}42}{12}\text{ years}\\
&= 4{,}7\text{ years}
\end{aligned}$$

The correct option is [1].

Ordinary calculator keys to use on a scientific calculator:

[**log**] [**(**] 1 ÷ [**(**] 1 [−] 106 250 [÷] 2 500 [×] 0,125 [÷] 12 [**)**] [**)**] [÷]
[**log**] [**(**] 1 + 0,125 [÷] 12 [**)**] [=]

56,42 appears on the screen, and that is 56,42 **months** or $\frac{56{,}42}{12}$ **years** = 4,7 years.

Important Note: It is clear that **knowledge of logarithms** is needed to find the value of the unknown exponent, n, in this case. Logarithms are not explained in the BNU1501 Study Guide because they are not part of the syllabus of this module. Therefore, you are advised to use the **financial keys** on the financial calculator here and in all other exercises where the **time period** of an investment or annuity has to be calculated.

Question 20

Note: In this question we deal with an **annuity** where **equal payments** are made into a certain account at **equal time intervals**.

What is given?

(i) The payment, **PMT**, is R500.

(ii) The annual (yearly) interest rate, **I/Y**, is 8%.

(iii) The time period, **N**, is (29-20) years = 9 years.

(iv) Interest is compounded weekly, that is 52 times per year.

What is required?

The future value, **FV**, is required in this question.

Method 1: By using the financial calculator.

2ndF **CA**
2ndF **P/Y** 52 **ENT** **ON/C**
± 500 **PMT**
8 **I/Y**
9 **2ndF** **× P/Y** **N**
COMP **FV**

342321,4765 appears on the screen.

The **future value** of this annuity is thus the amount that John will have saved in 9 years and is R342 321,48.

The correct option is [4].

Method 2: By substituting into the relevant formula.

The relevant formula to use in this case is the **future value** formula.

$$\begin{aligned} S &= R\left[\frac{(1+i)^n-1}{i}\right] \\ &= 500\left[\frac{\left(1+\frac{0,08}{52}\right)^{52\times 9}-1}{\frac{0,08}{52}}\right] \\ &= 342\,321{,}4765 \qquad \text{(See calculator steps below.)} \end{aligned}$$

The future value of this annuity is thus the amount that John will have saved in 9 years, which is R342 321,48.

The correct option is [4].

Ordinary calculator steps:

500 [×] [(] [(] [(] 1 [+] 0,08 [÷] 52 [)] [2ndF] [y^x] [(] 52 [×] 9 [)] [−] 1 [)] [÷] [(] 0,08 [÷] 52 [)] [)] [=]

END OF THE SOLUTIONS FOR ASSIGNMENT 02, SEMESTER 1