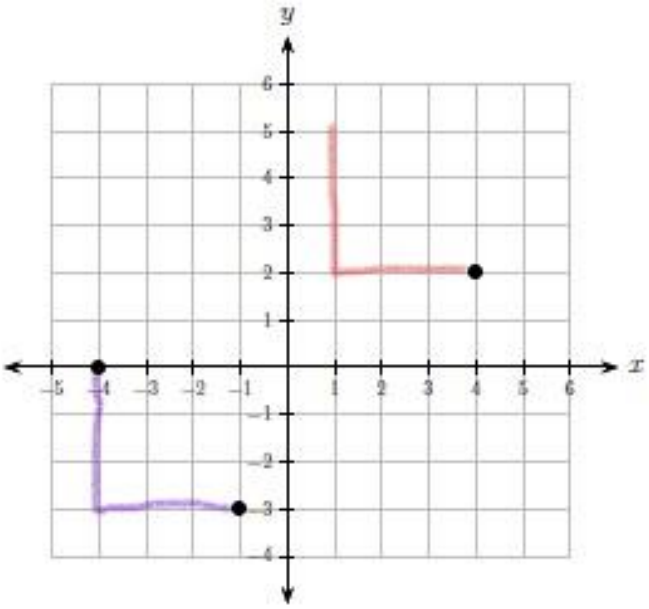
Basic Numeracy

BNU1501 Assignment 4 Possible Solutions

Semester 1, 2020

Question 1



You want to draw a rectangle using the three given points. The coordinates of the fourth point that is required to draw the rectangle, is…

There are numerous ways of figuring out the fourth point, students are advised to apply logic to do so.

Following the purple lines, and starting from the bottommost dot at $(-1;\ -3)$, the path joining these two dots moves three units to the left in the x direction (-3) and three units up in the y direction $(+3)$ to the point $(-1-3;\ -3+3) = (-4;\ 0)$

Follow the same path of the red line starting from the dot at $(4;\ 2)$ to get to the fourth point $(4-3;\ 2+3)\ =\ (1;\ 5)$

[Option 1]

Question 2

Consider the equation

$$2y = 4x - 2.$$

The line that is represented by this equation is…

First express the given equation in standard form:

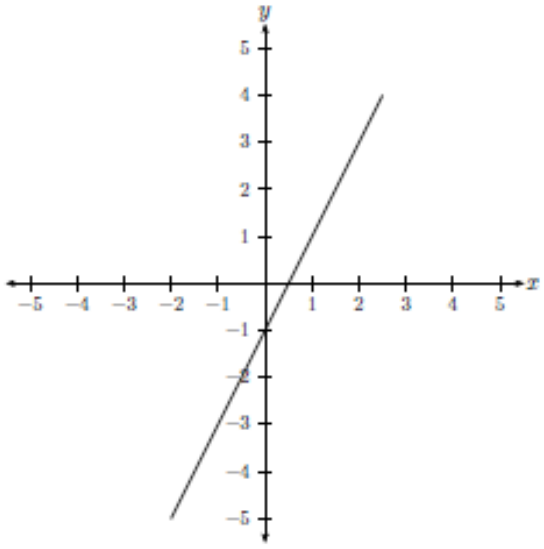
$$y = mx + c$$

by dividing every term by 2 to get:

$$y = 2x - 1$$

The graph of this equation has a positive slope, $m = 2$, meaning that it is an ascending line (going up from left to right), and a y −intercept, $c = -1$, meaning that it cuts the vertical y −axis at a value of $y = -1$. The line with these properties is Option 1. One can also find the x −intercept, which is the value of x when the line cuts the horizontal x −axis by setting $y = 0$ and solving for x to get $x = \frac{1}{2}$.

So, our line has intercepts at $\left(\frac{1}{2}; 0\right)$ and $(0;\ -1)$



[Option 1]

Question 3

Frieda sells caps at a market. If she charges R50 per cap she sells 26 caps per day. If she charges R80 per cap she sells only 11 caps per day. Let *x* represent the price of a cap and let *y* represent the number of caps that is sold per day. If the number of caps sold is dependent on the price asked, the function describing this linear relationship is

Given that the number of caps sold, y is dependent on the price asked, x, we need to come up with an equation of the form: $y = mx + c$

From the given information, two points $(x_1;\ y_1)$ and $(x_2;\ y_2)$ can be drawn. These points are $(50; 26)$ and $(80; 11)$. Where

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{11 - 26}{80 - 50} = -\frac{1}{2}$$

Now rewrite the equation of the straight line with the calculated value of m

$$y = -\frac{1}{2}x + c$$

Using one of the points and the above equation, the value of c can be calculated.

$y = -\frac{1}{2}x + c$

Using $(50; 26)$

$26 = -\frac{1}{2}(50) + c$

$26 = -25 + c$

$26 + 25 = c = 51$

The function describing the linear relationship between the number of caps sold and the price is therefore: $y = -\frac{1}{2}x + 51$ ***[Option 3]***

Question 4

Jafta invested one half of his savings in a bond that paid 9,5% simple interest per year for two years and received R589,00 as interest. The value of his total savings before making the investment was

For Simple Interest, use the Simple Interest formulas but first write down the given information

Interest, $I = R589.00$

Interest rate, $r = 9.5\% = 0.095$

Time period, $t = 2\ years$

Find the Principal or Present Value, P

Choose the formula that connects *I, r, t* and *P* and make *P* the subject of that formula.

$I = Prt$

And $P = \frac{I}{rt} = \frac{589}{0.095 \times 2} = R3\ 100$

This amount was *half* of his total savings; therefore, his total savings were $R6\ 200$

[Option 2]

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Question 5

Six years ago, Teboho invested *R13 125,00* at a yearly simple interest rate. Two years ago, he withdrew the total accumulated sum of *R17 850,00*. The yearly simple interest rate, *i*, at which Teboho invested the *R13 125,00* six years ago, rounded to one decimal place, is…

Principal: $P = 13\ 125$

Future Value: $S = 17850$

Period: $t = 6 - 2 = 4$

Interest rate: $r =?$

The equation that connects these four variables is:

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

Making r the subject of this formula yields

$$r = \frac{S - P}{Pt} = \frac{17850 - 13125}{13125 \times 4} = 0.09$$

Convert the interest rate to a percentage by multiplying by 100

$$r = 0.09 \times 100 = 9.0\%$$

[Option 4]

Question 6 (Scientific Calculator)

Sam invested $R6\ 800{,}00$ at $12{,}0\%$ interest per year, compounded monthly. The number of months he has to wait for this amount to grow to $R9\ 165{,}37$, rounded to two decimal places, is

$P = 6800$

$S = 9165.37$

$i = 12\%\ monthly = \frac{0.12}{12} = 0.01$

$n =?$

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

n is in months. Make n the subject of the formula

$\frac{S}{P} = (1+i)^n$

$\log\frac{S}{P} = \log(1+i)^n$

$\log\frac{S}{P} = n\log(1+i)$

$\frac{\log\frac{S}{P}}{\log(1+i)} = n$

$n = \frac{\log\frac{S}{P}}{\log(1+i)} = \frac{\log\left(\frac{9165.37}{6800}\right)}{\log(1+0.01)} = 29.99997122 \approx 30.00$

[Option 4]

Question 6 (Financial Calculator)

Sam invested $R6\ 800{,}00$ at $12{,}0\%$ interest per year, compounded monthly. The number of months he has to wait for this amount to grow to $R9\ 165{,}37$, rounded to two decimal places, is

$P/Y = 12$ (for monthly)

$PV = 6800 \pm$

$FV = 9165.37$

$I/Y = 12$

$N =$? (in months)

Calculator steps

2ndF CA

2ndF P/Y 12 ENT ON/C

6800 +/- PV

9165.37 FV

12 I/Y

COMP N

$N = 30.00$

[Option 4]

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Question 7 (Financial Calculator)

John deposits $R900{,}00$ into a savings account paying $6{,}5\%$ interest per year, compounded quarterly. After three and a half years he withdraws $R1\ 000{,}00$ from the account. How much is the total amount accrued in the account two years after withdrawing the $R1\ 000{,}00$? The correct answer, rounded to the nearest rand, is

First find how much has accumulated in the account after three and a half years

$P/Y = 4$ (for quarterly)

$PV = 900\ \pm$

$I/Y = 6.5$

$N = 3.5\ (calculator\ will\ multiply\ this\ by\ the\ P/Y\ value)$

$FV =?$

Calculator steps

2ndF CA

2ndF P/Y 4 ENT ON/C

900 +/- PV

6.5 I/Y

3.5 2ndF ×P/Y N

COMP FV

$FV = R1127.85$

After three and a half years, the account had R1127.85 and then R1000 was withdrawn so that the account was now left with R127.85. We need to find out the accumulated amount after a further two years.

$P/Y = 4$

$PV = 127.85\ \pm$

$I/Y = 6.5$

$N = 2$

$FV =?$

Calculator steps

2ndF CA

2ndF P/Y 4 ENT ON/C

127.85 +/- PV

6.5 I/Y

2 2ndF ×P/Y N

COMP FV

$FV = R145.45 \approx R145.00$

[Option 2]

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Question 7 (Scientific Calculator)

John deposits $R900{,}00$ into a savings account paying $6{,}5\%$ interest per year, compounded quarterly. After three and a half years he withdraws $R1\ 000{,}00$ from the account. How much is the total amount accrued in the account two years after withdrawing the $R1\ 000{,}00$? The correct answer, rounded to the nearest rand, is

First find how much has accumulated in the account after three and a half years

$P = 900$

$i = 6.5\%\ quarterly = \frac{0.065}{4} = 0.01625$

$n = 3.5 \times 4 = 14$

$S =?$

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

$S = 900(1 + 0.01625)^{14}$

$S = R1127.85$

After three and a half years, the account had R1127.85 and then R1000 was withdrawn so that the account was now left with R127.85. We need to find out the accumulated amount after a further two years.

$P = 127.85$

$i = 0.01625$

$t = 2 \times 4 = 8$

$S =?$

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

$S = 127.85(1 + 0.01625)^8 = R145.45 \approx R145.00$

[Option 2]

Question 8 (Financial Calculator)

Molemo is planning a trip to America to visit his friend in two years' time. He makes an itinerary for his holiday and decides to deposit $R9\ 800{,}00$ into a savings account at the end of every six months. The first deposit starts six months from now. The account earns interest at the rate of $10{,}7\%$ per year, compounded half-yearly. The amount that he will have in his account at the end of two years is

$P/Y = 2$ (for half-yearly)

$PMT = 9800 \pm$

$I/Y = 10.7$

$N = 2$

$FV =?$

Calculator steps

2ndF CA

2ndF P/Y 2 ENT ON/C

9800 +/- PMT

10.7 I/Y

2 2ndF ×P/Y N

COMP FV

$FV = R42\ 459.50$

[Option 1]

Question 8 (Scientific Calculator)

Molemo is planning a trip to America to visit his friend in two years' time. He makes an itinerary for his holiday and decides to deposit $R9\ 800{,}00$ into a savings account at the end of every six months. The first deposit starts six months from now. The account earns interest at the rate of $10{,}7\%$ per year, compounded half-yearly. The amount that he will have in his account at the end of two years is

$R = 9800$

$i = 10.7\%\ half - yearly = \frac{0.107}{2} = 0.0535$

$n = 2 \times 2 = 4$

$S =?$

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

$S = 9800\left[\frac{(1+0.0535)^4 - 1}{0.0535}\right]$

$S = R42\ 459.50$

[Option 1]

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Question 9 (Financial Calculator)

Tendai bought an empty stand for $R240\ 000{,}00$. He made a down payment of $R100\ 000{,}00$ and obtained a $20 - year$ mortgage bond for the balance at an interest rate of $19{,}5\%$ per annum, compounded monthly. The size of his monthly payments is…

The balance (loan amount) after paying a down payment (deposit) of $R100\ 000$ is

$Balance = 240\ 000 - 100\ 000 = 140\ 000$

$P/Y = 12$

$PV = 140\ 000 \pm$

$I/Y = 19.5$

$N = 20\ (\times 12)$

$PMT =$?

Calculator Steps

2ndF CA

2ndF P/Y 12 ENT ON/C

140 000 +/- PV

19.5 I/Y

20 2ndF ×P/Y N

COMP PMT

$PMT = R2\ 353.53$

[Option 3]

Question 9 (Scientific Calculator)

Tendai bought an empty stand for $R240\ 000{,}00$. He made a down payment of $R100\ 000{,}00$ and obtained a $20 - year$ mortgage bond for the balance at an interest rate of $19{,}5\%$ per annum, compounded monthly. The size of his monthly payments is…

The balance (loan amount) after paying a down payment (deposit) of $R100\ 000$ is

$$Balance = 240\ 000 - 100\ 000 = 140\ 000$$

$$P = 140\ 000$$

$$i = 19.5\% = \frac{0.195}{12} = 0.01625$$

$$n = 20\ (\times 12) = 240$$

$$R = ?$$

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

Making R the subject yields

$$R = \frac{Pi(1+i)^n}{(1+i)^n - 1}$$

$$R = \frac{140\ 000(0.01625)(1+0.01625)^{240}}{(1+0.01625)^{240} - 1}$$

$$R = R2\ 323.53$$

[Option 3]

Question 10 (Financial Calculator)

Zandile is about to purchase a car for $R191\ 810{,}00$ on terms from a car dealer. The terms are $R23\ 235$ deposit and the rest paid in equal quarterly payments of $R13\ 292{,}48$ at the end of each quarter for four years. The interest rate is $11{,}5\%$ per year, compounded quarterly. Considering the amortisation schedule, the principal repaid during the third quarter of the first year, is equal to…

Use the given information to compute the PMT so that it matches the given value of $R13\ 292{,}48$

$P/Y = 4$

$PV = 191\ 810 - 23\ 235 = 168\ 575\ \pm$

$I/Y = 11.5$

$N = 4\ (\times 4)$

$PMT =$?

<u>Calculator Steps</u>

2ndF CA

2ndF P/Y 4 ENT ON/C

168 575 +/- PV

11.5 I/Y

4 2ndF ×P/Y N

COMP PMT

$PMT = R13\ 292.48$

The calculation for the Principal Repaid during the third quarter of the first year continues from the above computation…

The 3rd quarter of the first year is the 3rd payment so both values for P1 and P2 are set at 3.00

Perform the following steps on the financial calculator…

KEY	DISPLAY ON CALCULATOR
AMRT	AMRT P1= 1.00
3 ENT	AMRT P1= 3.00
DOWN ARROW	AMRT P2= 1.00
3 ENT	AMRT P2= 3.00
DOWN ARROW	BALANCE = -142 501.71
DOWN ARROW	**∑PRINCIPAL= 8 938.57**

[Option 4]

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Question 10 (Scientific Calculator)

Zandile is about to purchase a car for $R191\ 810{,}00$ on terms from a car dealer. The terms are $R23\ 235$ deposit and the rest paid in equal quarterly payments of $R13\ 292{,}48$ at the end of each quarter for four years. The interest rate is $11{,}5\%$ per year, compounded quarterly. Considering the amortisation schedule, the principal repaid during the third quarter of the first year, is equal to…

The quarterly payment of $R13\ 292.48$ is made up of the Principal Repaid and the Interest Due. The Interest Due in the 3^{rd} quarter is calculated from the Balance from the 2^{nd} quarter.

$P = 168\ 575$

$R = 13\ 292.48$

$i = 11.5\%\ quarterly = \dfrac{0.115}{4} = 0.02875$

$n = 2$

Outstanding Principal (Balance) in the second quarter is given by

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

$$Balance = 168\ 575(1+0.02875)^2 - 13\ 292.48\left[\frac{(1+0.02875)^2 - 1}{0.02875}\right]$$

$Balance = 178\ 407.40 - 26\ 967.12 = R151\ 440.28$

The Interest due in the 3rd quarter is calculated from this amount

$Interest\ due, I = Prt\ 9$

$I = 151\ 440.28 \times 0.02875 \times 1 = R4\ 353.91$

$Principal\ repaid = Payment - Interest\ due$

$Principal\ repaid = 13\ 292.48 - 4\ 353.91 =$ ***R8 938. 57*** ***[Option 4]***