FINANCE, GROWTH AND DECAY

Solutions

DBE's own marking guidelines, in booklet order

Every solution here is a clip of the official DBE marking guideline published with the paper the question came from. The working, the mark ticks and the accepted alternatives are DBE's. Nothing has been rewritten or re-derived.

The numbers match the question booklet: solution 34 answers question 34, and the chapters are in the same order.

DBE writes one guideline for both languages, so these pages are bilingual and their marking notes are largely in English. That is DBE's own page, reproduced as printed.

A marking guideline is written for markers, not learners. It shows the shortest route to the marks, so where a step looks compressed, that is the guideline being terse rather than a step missing.

1. Find the rate from four years' growth, then a monthly savings plan

Official DBE marking guideline · May/June 2021 · Q7 · 13 marks

QUESTION/*VRAAG* 7

7.1	$13\,080 = 10\,000\left(1+\frac{i}{4}\right)^{16}$ $\left(1+\frac{i}{4}\right)^{16} = \frac{13080}{10000}$ $1+\frac{i}{4} = \sqrt[16]{\frac{13080}{10000}}$ $\frac{i}{4} = 0{,}0169227...$ $i = 0{,}06769...$ $i = 6{,}77\%$	✓substitution into correct formula ✓$n = 16$ ✓ simplification ✓answer (A) (4)
7.2.1	$F = \frac{x\left[(1+i)^n - 1\right]}{i}$ $F = \frac{9\,000\left[\left(1+\frac{0{,}075}{12}\right)^{60} - 1\right]}{\frac{0{,}075}{12}}$ $F = \text{R } 652\,743{,}95$	✓ $\frac{0{,}075}{12}$ ✓ substitution into correct Formula ✓ answer (3)
7.2.2	$60 \times 9\,000 = \text{R}540\,000$ $A = P(1+i)^n$ $652\,743{,}95\left(1+\frac{0{,}075}{12}\right)^n = 190\,214{,}14 + 540\,000$ $730\,214{,}14 = 652\,743{,}95\left(1+\frac{0{,}075}{12}\right)^n$ $1{,}1186.... = (1{,}00625)^n$ $n = \log_{1{,}00625}(1{,}1186)$ $\therefore n = 18$ months	✓$60 \times 9\,000 = \text{R}540\,000$ ✓✓ equation ✓simplification ✓use of logs ✓ 18 months (6)

	OR/OF Interest over 5 years = 652 743,95 – 9 000 × 60 = 112 743,95 ∴ interest on n years = 190 214,14 – 112 743, 95 = 77 470,19 $652\ 743{,}95 + 77\ 470{,}19 = 652\,743{,}95\left(1+\frac{0{,}075}{12}\right)^{n}$ $1{,}1186.... = (1{,}00625)^{n}$ $n = \log_{1{,}00625}(1{,}1186)$ $\therefore n = 18$ months	**OR/OF** ✓ 60 × 9 000 ✓ answer ✓equating ✓simplification ✓use of logs ✓ 18 months (6)
		[13]

2. A phone's depreciation rate, then two people saving for one holiday

Official DBE marking guideline · May/June 2024 · Q7 · 13 marks

QUESTION 7/*VRAAG* 7

7.1	$A = P(1-i)^n$ $8\,337{,}75 = 13\,000(1-i)^6$ $i = 7{,}14\%$	✓ substitution in correct formula ✓✓ answer (3)
7.2	$F = \frac{x\left[(1+i)^n - 1\right]}{i}$ $80\,000 = \frac{x\left[\left(1+\frac{8{,}6}{1200}\right)^{36} - 1\right]}{\frac{8{,}6}{1200}}$ $x =$ R1 955,78 Thandi's total = 1955,78 × 36 = R 70 408,08 Eric's total = 1402,31 × 48 = R 67 310,88 Difference = 70 409,08 – 67 310,88 = R3 097,20	✓ i ✓substitution into correct formula ✓answer ✓ answer (4)
7.3	$A = P(1+i)^n$ $A = 225\,000\left(1+\frac{0{,}09}{12}\right)^3$ $A = R\,230100{,}5637...$ $225000\left(1+\frac{0{,}09}{12}\right)^3 = \frac{5500\left[1-\left(1+\frac{0{,}09}{12}\right)^{-n}\right]}{\frac{0{,}09}{12}}$ $0{,}3137734959... = 1-\left(1+\frac{0{,}09}{12}\right)^{-n}$ $\left(1+\frac{0{,}09}{12}\right)^{-n} = 0{,}6862265041...$ $-n = \log_{\left(1+\frac{0{,}09}{12}\right)} 0{,}6862265041...$ $n = 50{,}394375...$ $n = 51$	✓ substitution in correct formula ✓ answer ✓ substitution ✓ simplification ✓ use of logs ✓ answer (6)
		[13]

3. The effective rate, then drawing an income back out of an investment

Official DBE marking guideline · May/June 2025 · Q7 · 13 marks

QUESTION/*VRAAG* 7

7.1	$(1+i)=\left(1+\frac{15}{1200}\right)^{12}$ $i=16{,}08\%$	✓substitution into correct formula ✓answer (2)
7.2	$P=\frac{x\left[1-(1+i)^{-n}\right]}{i}$ $500\,000=\frac{11\,250\left[1-\left(1+\frac{0{,}06}{4}\right)^{-n}\right]}{\frac{0{,}06}{4}}$ $\frac{2}{3}=1-\left(1+\frac{0{,}06}{4}\right)^{-n}$ $(1{,}015)^{-n}=\frac{1}{3}$ $-n=\log_{1{,}015}\left(\frac{1}{3}\right)$ $n=73{,}788\ldots$ $\therefore n=73$ withdrawals	✓ $i=\frac{0{,}06}{4}$ ✓ substitution into correct formula ✓correct use of logs ✓answer for n ✓final answer (5)
7.3	$A=P(1+i)^n$ $=12\,000\left(1+\frac{0{,}095}{12}\right)^{12\times4}$ $=\text{R }17\,521{,}17895\ldots$ $F=\frac{x[(1+i)^n-1]}{i}$ $F=\frac{500\left[\left(1+\frac{0{,}095}{12}\right)^{24}-1\right]}{\frac{0{,}095}{12}}$ $=\text{R }13\,158{,}64744\ldots$ Total = 17 521,17895… + 13 158,64744… = R30 679,83	✓ $i=\frac{0{,}095}{12}$ ✓ $n=48$ in A ✓ substitution into correct formula ✓ $n=24$ in F ✓ substitution into correct formula ✓ adding compound and future values (6)
		[13]

4. The rate from 24 months' growth, then a run of monthly deposits

Official DBE marking guideline · November 2022 · Q6 · 14 marks

QUESTION 6/*VRAAG* 6

6.1	$A = P(1+i)^n$ $13\,459 = 12\,000\left(1+\frac{m}{400}\right)^8$ $\left(1+\frac{m}{400}\right)^8 = 1{,}121...$ $1+\frac{m}{400} = \sqrt[8]{1{,}121..}$ $\frac{m}{400} = 0{,}0144...$ $\therefore m = 5{,}78\%$	✓ 8 ✓ subst into correct formula ✓ $1+\frac{m}{400} = \sqrt[8]{1{,}121..}$ ✓ 5,78 % (4)
6.2	$F = \frac{x\left[(1+i)^n - 1\right]}{i}$ $F = \frac{1\,000\left[\left(1+\frac{0{,}075}{12}\right)^{12} - 1\right]}{\frac{0{,}075}{12}}$ = R12 421,22 He won't be able to buy the computer because R13 000 – R12 421,22 = R578,78 **OR/OF** He won't be able to buy the computer because R12 421,22 < R13 000	✓ $\frac{0{,}075}{12}$ ✓ 12 ✓ answer ✓ conclusion (4)
6.3.1	Loan amount = 85% × R250 000 = R212 500 **OR/OF** Loan amount = R250 000 – (15% × R250 000) = R212 500	✓ answer (1) **OR/OF** ✓ answer (1)
6.3.2	$A = 212\,500\left(1+\frac{0{,}13}{12}\right)^5$ A = 224 262,53 $P = \frac{x\left[1-(1+i)^{-n}\right]}{i}$ $224\,262{,}53 = \frac{x\left[1-\left(1+\frac{0{,}13}{12}\right)^{-67}\right]}{\frac{0{,}13}{12}}$ $\therefore x = R4\,724{,}96$	✓ $A = 212\,500\left(1+\frac{0{,}13}{12}\right)^5$ ✓answer ✓ substitution into correct formula ✓ – 67 ✓ answer (5)
		[14]

5. Sixteen years of compound growth, then the rate that halves a value

Official DBE marking guideline · November 2024 · Q7 · 14 marks

QUESTION/*VRAAG* 7

7.1	$A = P(1+i)^n$ $A = 5\,000\left(1+\frac{6,8}{400}\right)^{64}$ $= \text{R}\,14\,706,56$	✓ *i*, *n* ✓ substitution into correct formula ✓ answer (3)
7.2	$A = P(1-in)$ $\frac{1}{2}P = P(1-4i)$ $\frac{1}{2} = (1-4i)$ $i = \frac{1}{8}$ $\therefore r = 12,5\%$ **OR/*OF*** $r = \frac{50\%}{4}$ $r = 12,5\%$	✓substitution into correct formula ✓ answer (2) **OR/*OF*** ✓ method ✓ answer (2)
7.3.1	Already paid: $2\,300,98 \times 60 = \text{R}\,138\,\,058,80$ Interest: 138 058,80 – 100 000 = R 38 058,80	✓ amount already paid ✓ interest (2)

7.3.2	Balance after 2 years: $P = \frac{x\left[1-(1+i)^{-n}\right]}{i}$ $P = \frac{2\,300,98\left[1-\left(1+\frac{13,5}{1200}\right)^{-36}\right]}{\frac{13,5}{1200}}$ $= \text{R } 67\,804,94$ R 67 804,94 – R20 000 = R 47 804,94 $P = \frac{x\left[1-(1+i)^{-n}\right]}{i}$ $47\,804,94 = \frac{2\,300,98\left[1-\left(1+\frac{13,5}{1200}\right)^{-n}\right]}{\frac{13,5}{1200}}$ $0,766 = (1,01125)^{-n}$ $\log_{1,01125} 0,766 = -n$ $n = 23,83$ $\therefore$ 12 months earlier **OR/*OF***	✓n= 36 ✓i ✓ substitution into correct formula ✓ answer ✓ answer ✓substitution into correct formula ✓ answer in months (7) **OR/*OF***
	$A = 100\ 000\left(1+\frac{13,5}{1200}\right)^{12\times 2}$ $= \text{R}130\,799,12$ $F = \frac{2\,300,98\left[\left(1+\frac{13,5}{1200}\right)^{12\times 2}-1\right]}{\frac{13,5}{1200}}$ $= \text{R } 62\,993, 92$ Balance outstanding = A – F = 130 799,12 – 62 993,92 = R67 805,20 R 67 805,20 – R20 000 = R 47 805,20 $P = \frac{x\left[1-(1+i)^{-n}\right]}{i}$ $47\,805,20 = \frac{2\,300,98\left[1-\left(1+\frac{13,5}{1200}\right)^{-n}\right]}{\frac{13,5}{1200}}$ $0,766... = (1,01125)^{-n}$ $\log_{1,01125} 0,766... = -n$ $n = 23,80$ $\therefore$ 12 months' earlier	✓n = 24 ✓i ✓ substitution into both correct formulae ✓ answer ✓ answer ✓ substitution into correct formula ✓ answer in months (7)

	OR/OF	**OR/OF**
	$100\ 000 = \dfrac{2\ 300,98\left[1-\left(1+\dfrac{13,5}{1200}\right)^{-n}\right]}{\dfrac{13,5}{1200}} + 20\ 000\left(1+\dfrac{13,5}{1200}\right)^{-24}$ $84\ 709,38 = \dfrac{2\ 300,98\left[1-\left(\dfrac{809}{800}\right)^{-n}\right]}{\dfrac{0,135}{12}}$ $0,4142 = 1-\left(\dfrac{809}{800}\right)^{-n}$ $\left(\dfrac{809}{800}\right)^{-n} = 0,5858$ $-n = \log_{\left(\frac{809}{800}\right)} 0,5858$ n = 47,80 months after starting payments $\therefore$ 12 months earlier	✓ i ✓ n = 24 ✓= 100 000 ✓ substitution into correct P formula ✓ substitution into correct A formula ✓ simplification ✓ answer in months (7)
		[14]

6. How long an investment takes to double, then machinery losing its value

Official DBE marking guideline · May/June 2022 · Q7 · 15 marks

QUESTION 7

7.1	$A = P(1+i)^n$ $2 = 1\left(1+\frac{0,085}{4}\right)^{4n}$ $4n = \log_{\left(1+\frac{0,085}{4}\right)} 2$ $n = 8,24$ years	✓ 2 ✓ $\frac{0,085}{4}$ } In correct formula ✓ use of logs ✓ answer in years (4)
7.2.1	$A = P(1-i)^n$ $180\ 000 = 500\ 000(1-i)^5$ $\frac{9}{25} = (1-i)^5$ $\sqrt[5]{\frac{9}{25}} = 1-i$ $i = 0,1848068...$ $r = 18,48\%$	✓ subs into correct formula ✓ simplification ✓ $i = 0,1848\ldots$ ✓ answer (4)
7.2.2	$A = P(1+i)^n$ $A = 500\ 000(1+0,063)^5$ A = R678 635,11	✓ subs into correct formula ✓ answer (2)
7.2.3	Sinking Fund = 678 635,11 – 180 000 = R 498 635,11 $498\ 635,11 = \frac{x\left[\left(1+\frac{0,1025}{12}\right)^{58}-1\right]\left(1+\frac{0,1025}{12}\right)^{3}}{\frac{0,1025}{12}}$ $x = R6\ 510,36$	✓ value of sinking fund ✓ $\frac{0,1025}{12}$ ✓ $n = 58$ (A) ✓ $\left(1+\frac{0,1025}{12}\right)^{3}$ ✓ answer (A) (5)
		[15]

7. A tractor's book value, then how long R75 000 takes to grow

Official DBE marking guideline · November 2021 · Q8 · 16 marks

QUESTION/VRAAG 8

8.1	$A = P(1-i)^n$ $A = 980\ 000(1-0,092)^7$ $A = R498\ 685,82$	✓ correct formula ✓ substitution ✓ answer (A) (3)
8.2	$A = P(1+i)^n$ $116\ 253,50 = 75000\left(1+\frac{0,068}{4}\right)^{4n}$ $1,550\ 046\ 667 = (1,017)^{4n}$ $\log(1,550\ 046\ 667) = 4n\log(1,017)$ $4n = \frac{\log(1,550\ 046\ 667)}{\log(1,017)}$ or $4n = \log_{1,017}(1,550\ 046\ 667)$ $4n = 25,99\ \ldots$ $n = 6,50$ years	✓ $\frac{0,068}{4}$ ✓ substitution in correct formula ✓ correct use of logs ✓ answer (4)
8.3.1	$F = \frac{x\left[(1+i)^n - 1\right]}{i}$ $450\ 000 = \frac{x\left[\left(1+\frac{0,0835}{12}\right)^{60} - 1\right]}{\frac{0,0835}{12}}$ $x = R6\ 068,69$	✓ $i = \frac{0,0835}{12}$ ✓substitution into correct formula ✓answer (3)
8.3.2(a)	$P = \frac{x\left[1-(1+i)^{-n}\right]}{i}$ $P = \frac{11\ 058,85\left[1-\left(1+\frac{0,12}{12}\right)^{-4\times12}\right]}{\frac{0,12}{12}}$ $P = R419\ 948,32$ **OR/*OF*** Balance = A – F $= P(1+i)^n - \frac{x\left[(1+i)^n - 1\right]}{i}$ $=1\ 050\ 000\left(1+\frac{0,12}{12}\right)^{12\times21} - \frac{11\ 058,85\left[\left(1+\frac{0,12}{12}\right)^{12\times21} - 1\right]}{\frac{0,12}{12}}$ =R12 887 702,20 – R12 467 749,81 =R419 952,39	✓ $n = 48$ in P-formula ✓substitution into correct formula ✓answer (A) (3) **OR/*OF*** ✓n = 252 in both formulae ✓ subst into correct formulae ✓answer (A) (3)

8.3.2(b)	Total paid $= 11\,058,85 \times 21 \times 12 = 2\,786\,830,20$ Loan Paid $= 1\,050\,000 - 419\,948,32 = 630\,051,68$ Interest paid = 2 786 830,20 – 630 051,68 = R2 156 778,52 **OR/OF** Total paid $= 11\,058,85 \times 21 \times 12 = 2\,786\,830,20$ Loan Paid $= 1\,050\,000 - 419\,952,39 = 630\,047,61$ Interest paid = 2 786 830,20 – 630 047,61 = R2 156 782,59 **OR/OF** Interest paid = 11 058,85 × 21 × 12 – (1 050 000 – 419 948,32) = 2 786 830,20 – 630 051,68 = R2 156 778,52	✓ $11\,058,85 \times 21 \times 12$ ✓ 1 050 000 – Balance Outstanding ✓ answer (3) **OR/OF** ✓ $11\,058,85 \times 21 \times 12$ ✓ 1 050 000 – Balance Outstanding ✓ answer (3) **OR/OF** ✓ $11\,058,85 \times 21 \times 12$ ✓ 1 050 000 – Balance Outstanding ✓ answer (3)
		[16]

8. r and the effective rate from six months, then replacing a laptop

Official DBE marking guideline · November 2023 · Q6 · 16 marks

QUESTION 6/*VRAAG* 6

6.1.1	$A = P(1+i)^n$ $19\,319{,}48 = 18\,500\left(1+\frac{r}{1200}\right)^6$ $\left(1+\frac{r}{1200}\right) = \sqrt[6]{1{,}04429...}$ $\frac{r}{1200} = 0{,}00725...$ $r = 8{,}7\%$	✓ $n = 6$ ✓substitution into correct formula ✓answer (3)
6.1.2	$1+\frac{i}{100} = \left(1+\frac{8{,}7}{1200}\right)^{12}$ $r = 9{,}06\%$	✓substitution into correct formula ✓answer (2)
6.2.1	$A = P(1-in)$ $0 = 10\ 000(1-0{,}2n)$ $n = 5$	✓substitution into correct formula ✓answer (2)
6.2.2	$F = \frac{x\left[(1+i)^n - 1\right]}{i}$ $20\,000 = \frac{x\left[\left(1+\frac{8{,}7}{1200}\right)^{60} - 1\right]}{\frac{8{,}7}{1200}}$ $x = \text{R}267{,}26$	✓ i ✓ n ✓substitution into correct formula ✓answer (4)
6.3	$P = \frac{x\left[1-(1+i)^{-n}\right]}{i}$ $1\,600\,000 = \frac{20\,000\left[1-\left(1+\frac{0{,}112}{12}\right)^{-n}\right]}{\frac{0{,}112}{12}}$ $\frac{56}{75} = 1-\left(1+\frac{0{,}112}{12}\right)^{-n}$ $\left(1+\frac{0{,}112}{12}\right)^{-n} = \frac{19}{75}$ $-n = \log_{\left(1+\frac{0{,}112}{12}\right)}\left(\frac{19}{75}\right)$ $-n = -147{,}80$ Tino will make 147 withdrawals of R20 000	✓i ✓substitution into correct formula ✓correct use of logs ✓ $-n = -147{,}80$ ✓ $n = 147$ (5)
		[16]