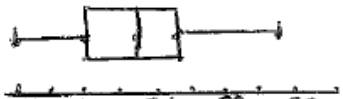
Engage Education End of Year Revision Lectures
Further Maths Core Solutions

Core – Data

1) D – temperature is numerical, town is categorical
2) (VCAA Exam 2 2006)
② Displaying Univariate Data
STATISTICS App on calculator
1 Variable Statistics
5 Figure Summary
$n = 14$
$\min = 76$
$Q_1 = 80$
$med = 83$
$Q_3 = 85.8$
$max = 89.8$
Draw boxplot scaled accurately!


3) Walked – 10; Sat or Stood – 7; Ran – 8
4) Addition of 16 to the stem and leaf plot

stem (10s)	leaf (units)
0	0
1	2 4 6
2	0 1 3 3 4 4 4
3	2 3 3 6 7 8
4	3 4 7 8
5	6

5) A – 14%, from the graph
6) Yes, an association is indicated. % who ran decreased as year level increased i.e. 78% -> 40% -> 10%
7) E – 86%, from the bar graph
8) A – 1, as 1 has the most dots in it

$$\frac{7+1}{2} = 8th\ position$$

9) 580 – there are 3 x 580 in the stem and leaf plot
10) B – 6. Use a calculator and 1VarStats to get a 5 figure summary for the data. Then calculate the IQR by hand.
Q1 = 5th score = 19
Q3 = 14th score = 25
IQR = 25 – 19 = 6
11) C – 20%. Add the total number of countries and divide by 2, then see what range that fits into.

Sum = 54

$$\frac{54+1}{2} = \frac{55}{2} = 27.5$$

12) B – 40 and 45

(VCAA Exam 1 2006)

Need to cross over halfway mark of 50% from the graph

2+3+2+3+6+6+7+11+14=54

54/2 = 27, therefore the 27th value is the median. This falls between 40-45.

13) C – 25%

Greater than 14mm is the upper quartile – C

$\therefore Q_3 = 14mm$ which gives 25% percentage

14) E – process of elimination

15) C – look at the range to determine whether they're more variable, and notice that 75% of jellyfish from location A are less than 14mm diameter whilst 75% of jellyfish in location B are greater than 15mm in diameter. Therefore they are smaller overall at location A.

16) Yes it is an outlier.

From boxplot $Q_1 = 160$ $Q_3 = 170$

$IQR = 170 - 160 = 10$

Lower Cutoff $= Q_1 - 1.5IQR$

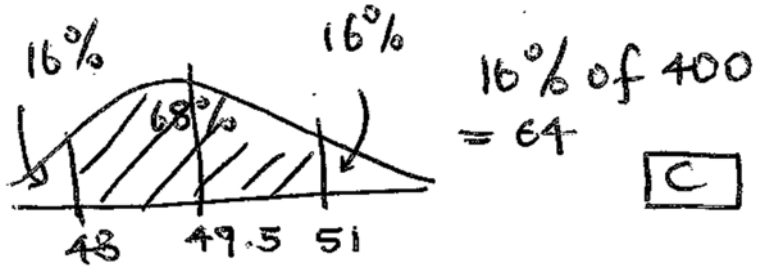
$= 160 - 1.5 \times 10$

$= 160 - 15$

$= 145$

New value 140 is still less than 145 (lowerfence/cutoff) so is still an outlier.

17) C – 64%



16% of 400 = 64

C

18) E – 125.9 and 6.0

Use statlist editor on calculator

1 Var stats $\bar{x} = 125.93\ldots$

mean $\rightarrow \bar{x} \simeq 125.9$ (1dp)

st.dev $\rightarrow \sigma_x = 5.957\ldots$

E $S_x \simeq 6.0$ (1dp)

Careful: DO NOT USE σ_x !

19) The distribution is approximately symmetrical therefore both mean and median are appropriate measures of centre and spread

20) -1.4 $\therefore$ *below average*

$z = \frac{\text{Score} - \text{Mean}}{\text{St. dev}}$

$= \frac{(83.1 - 89.3)}{4.5}$

$= -1.4$

Note:
* Remember to include brackets when calculating z value on calculator.

21) Yes

Yes, age of women at first marriage has increased over the years.
ie 30 years and over, % has increased from 26% in 1986 to 33.3% in 1996 to 42% in 2006

22) Positive related

Positively related means as one increases, the other tends to increase.
The boxplots show that as age of boys increases, median height of boys increases also.
ie 15mth (83cm) to 27mth (89.5cm) to 36 mth (95cm)

23) a. male income

b) \$0.35 for \$1 increase

∴ \$0.35 x 1000 for \$1000 increase

= \$350

24) i. FI = 1300 + 0.35 x 15000 = 18250

ii. This prediction is using extrapolation by going outside of the data range, therefore is unlikely to be accurate.

25) E

24) Step 1 Find 'm':

$m = \frac{r s_y}{s_x} = \frac{-0.5675 \times 6.98}{2.61}$

∴ $m = -1.5177$

Step 2 Find 'c'

$c = \bar{y} - m\bar{x}$

$= 23.93 - (-1.5177)(4.56)$

∴ $c = 30.85$

∴ $y = 30.85 - 1.5177x$

$y \simeq 30.9 - 1.52x$ [A]

26) As the residual plot appears random, the relationship is likely to be linear
27) a. 0.53
b) $r^2 = 0.7541^2 = 0.6$
c) 60% of the variation in height can be explained by variation in age
28) E – an increasing trend with seasonal variation
29) E – an increasing trend only
30) D – 446 – the month number will be 36. Substitute into equation.

3 years x 12 months =36 months

Sub into equation = 446

31) C – 70
32) C – 360

4 point moving mean with centring in month no. 5

3 4 5 6 — 4 point MV = 359
354 356 373 353

4 5 6 7 — 4 point MV = 361.5
356 373 353 364

Centred 4 point $\frac{359 + 361.5}{2}$
$\simeq 360.25$
$\simeq 360$ C

33) D – 375
34) D – 0.98 – all the seasonal indices should add up to 12 (the number of values there are)
35) C – 351 – deseasonalised value = actual value/seasonal index
36) A – 304 – use the number 6 as month number, then multiply it by the seasonal index
37) a. 1.1
b. 241mm

$$\text{Des} = \frac{\text{Actual}}{\text{SI}} = \frac{188}{0.78} = 241.03 \simeq 241 \text{ mm}$$

c. rainfall in autumn is typically 5% above average

Core – Recursion and Financial Modelling

1) B – 200
2) C - $56250
3) a. $V_{n+1}=V_n+$ (3.4/100 x 18000)
b. 1 year - $V_1=V_0+$ (3.4/100 x 18000) = $18612
2 years - $V_2=V_1+$ (3.4/100 x 18000) = $19224
3 years - $V_3=V_2+$ (3.4/100 x 18000) = $19836
c. $V_n = V_0 + nD$
22,000 = 18000 + n x (3.4/100 x 18000)
n = 6.5 years = 7 years
4) C – $V_0 = N$, $V_{n+1} = V_n + (3N/100)$
5) D - $20,000
6) E - $113000

7) D - $178
8) C – 12%

$2000 − $200 = $1800 Borrowed

$68 × 36 = $2448 Repay

$2448 − $1800 = $648 Interest Paid

$SI = \frac{Prt}{100}$

$648 = \frac{1800 \times r \times 3}{100}$

$r = 12$ C

9) D - $27.90

$720 − $180 = $540 Borrow

$SI = \frac{\$540 \times 12 \times 2}{100} = \$129.60$

Owe = $540 + $129.60

= $669.60

Monthly Repayment = $\frac{\$669.60}{24} = \$27.90$

10) B – 16.7%

$500 − $50 = $450 Borrow

Pay back $25 × 2 × 12 = $600

Interest $600 − $450

= $150

$150 = \frac{450 \times r \times 2}{100}$

$\therefore r = 16.67\%$

11) D - $24392
12) D – 10000 x 1.05^{10}
13) C – 8000 x 1.018^{16} – 8000 x 1.018^{12}
14) a. V_n= 7600 x (1 + [(6/12)/100])^n
b. V_n= 7600 x (1 + [(6/12)/100])^n
V_3= 7600 x (1 + [(6/12)/100])^3 = $7714.57
15) a. Option A = r = [(1+ (8.3/12)/100) ^{12} – 1] x 100% = 8.621%
Option B = r = [(1+ (7.8/52)/100) ^{52} – 1] x 100% = 8.104%
b. Option A: V_1= 35000 x (1 + [(8.3/12)/100])^{12} = $38018
Option B: V_1= 35000 x (1 + [(7.8/52)/100])^{52} = $37837
c. Option B, as it will compound less interest given the lower effective interest rate
16) D - $7132.42

N = 20 x 4 = 80 payments

I = 7.25

FV = 0

PV = 300000

P/Y = 4

C/Y = 4

PMT −7132.42

d

17) B - $413

N = 4 x 12 = 48 payments

I = 6.25

FV = 0

PV = 17500

P/Y = 12

C/Y = 12

PMT −412.99

18) A – 6.3%

N = 7 x 4 = 28

I = ☐ 6.3

PV = 100000

FV = −80000

PMT = −2150

P/Y = 4

C/Y = 4

19) B - $2457.60

N = 5 x 12 = 60

I = 9.2

PV = 18000

FV = 0

PMT = −375.40

P/Y = 12

C/Y = 12

After 10 repayments

N = 10

PV = 18000

FV = −15542.40

PMT = −375.40

P/Y = 12

C/Y = 12

Paid off $18000 − $15542.40

= $2457.60

20) D - $5711

N = 2
I% = 5
PV = −4000
PMT = −800
FV = 5710.625
P/Y = 4
C/Y = 4

21) B – 15%
22) a. i. 10% of 60000 = $6000
ii. 6000 – 3x 6000 = $42000
iii. 6000 – 6000n = 12000
6000n = 48000
N = 8
b. i. 15%
ii. V = 60000 x $(0.85)^3$ = $36847.3
iii. 6000 x 0.85^n < 12000
n = 9.9
23) a. $V_{n+1} = (1 – (4/100)) \times V_n$, $V_0 = 9800$
b. Use the formula to find the values
9408, 9031.68, 8670.41, 8323.59
c. From the sequence above, $V_3 = 8670.41$ and $V_4 = 8323.59$.
Therefore, the depreciation of the motorcycle in the 3rd year = $V_4 – V_3$ = $346.82
24) E - $35828
25) a. $720
b. simple interest, as the value increases by the same amount each year
c. $96
d. 13.3%
26) a. 7.5/4 = 1.875%
b. $375
c. $3926
d. $4227
e. $1139
27) B - $75
28) a. Using finance solver – 35.99 periods = 36 periods = 3 years
b. Using finance solver find the value of the loan after the 19th payment
N: 19
I: 3.6
PV: 150000
Pmt: -4896.66
FV: ? = -76866.48
Ppy: 4
Cpy: 4
Using finance solver, find the value of the loan after the 20th payment.
N: 1
I: 3.6
PV: 76866.48
Pmt: -4896.66
FV: ? = -72661.62
Ppy: 4
Cpy: 4

Subtract FV (20) from FV (19) to find the principal paid in the 20th payment
76866.48 – 72661.62 = 4204.86
Subtract the principal paid from the payment to find the amount of interest paid in the 20th payment.
4896.66 – 4204.86 = $691.8