Student Number: _____

2021 HSC TRIAL

Year 12 Mathematics Standard 2

General Instructions

- Reading time – 10 minutes
- Working time – $2\frac{1}{2}$ hours
- Write using black pen
- Start each section on a new page
- Write on one side only of A4 lined paper
- NESA approved calculators may be used
- A reference sheet will be provided with this paper
- For questions in Section II, show relevant mathematical reasoning and/or calculations

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Total marks: 100

Section I – 15 marks (pages 2–7)

- Attempt Questions 1–15
- Allow about 25 minutes for this section

Section II – 85 marks (pages 8–18)

- Attempt Questions 16–39
- Allow about 2 hours and 5 minutes for this section.

Section 1

15 marks
Attempt Questions 1-15
Allow about 25 minutes for this section

Start a new page
Answer on one side only of lined A4 paper

1. The Coordinated Universal Time (UTC) of Sydney, Australia is +10 hours and the UTC of Mexico City, Mexico is -5 hours.

What is the time in Mexico City if it is 8am on Monday in Sydney?

A. 5pm Sunday
B. 1pm Monday
C. 3pm Sunday
D. 1am Tuesday

2. The military is Australia is organised in ranks such as Private or Sergeant.

What sort of data is represented here?

A. Ordinal
B. Nominal
C. Nominal and ordinal
D. Neither nominal nor ordinal

3. In 1903 the fastest recorded speed in a motor bike was 103 kilometres per hour.

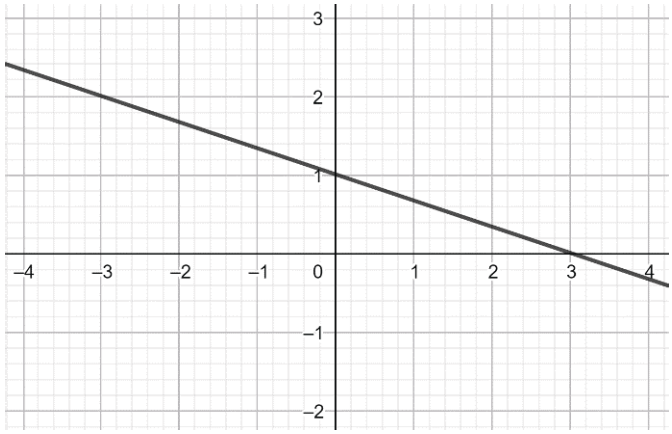
Express this as a rate in metres per second, to one decimal place.

A. 1.7 m/s
B. 6.18 m/s
C. 28.6 m/s
D. 37.1 m/s

4. A flight between Sydney and the USA takes 14 hours, to the nearest hour. The percentage error in measurement, correct to 2 decimal places is:

A. 0.04%
B. 2.14%
C. 3.57%
D. 5.88%

5. The equation of the line below is:



A. $y = -x + 3$
B. $y = \frac{1}{3}x + 1$
C. $y = 3x + 1$
D. $y = -\frac{1}{3}x + 1$

6. Phoebe wants to catch a train from Parramatta to Blacktown.
This is the table she would use.

Central	06:10	i06:23	06:23	06:25	06:34	-	06:38	06:40	i06:53
Redfern	06:12	–	06:25	06:27	06:36	-	06:40	06:42	–
Burwood	–	–	06:45	–	–	-	07:00	–	–
Strathfield	06:24	06:36	06:48	06:39	06:48	-	07:03	06:54	07:06
Lidcombe	06:30	–	06:56	06:45	–	-	07:11	07:00	–
Auburn	–	–	06:59	–	–	-	07:14	–	–
Clyde	–	–	07:02	–	–	-	07:17	–	–
Granville	–	–	07:03	–	–	-	07:18	–	–
Harris Park	–	–	07:06	–	–	07:01	07:21	–	–
Parramatta	06:37	06:48	07:08	06:52	07:00	07:06	07:23	07:07	07:18
Westmead	06:40	–	-	06:55	07:03	07:09	-	07:10	–
Wentworthville	–	–	-	–	07:05	07:11	-	–	–
Pendle Hill	–	–	-	–	07:08	07:14	-	–	–
Toongabbie	–	–	-	–	07:10	07:16	-	–	–
Seven Hills	06:47	–	-	07:02	07:13	07:19	-	07:16	–
Blacktown	06:51	06:57	-	07:06	07:17	07:23	-	07:20	07:27

What is the latest train Phoebe can catch from Parramatta to arrive at Blacktown Station before 7:15am?

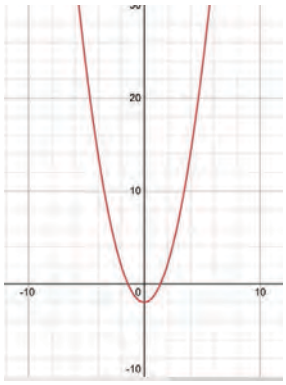
A. 6:25am
B. 6:48am
C. 6:52am
D. 7:06am

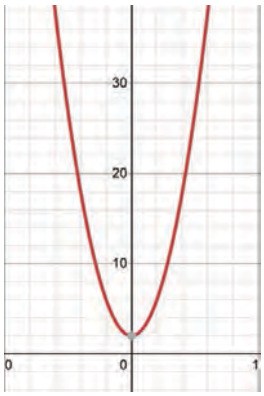
7. What is the mean of the data set below?

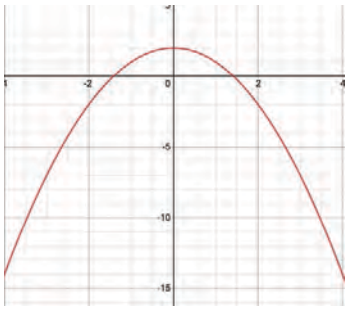
Score	1	3	5	7
Cumulative frequency	2	6	12	20

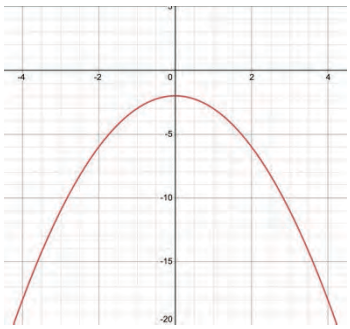
A. 4
B. 4.5
C. 5
D. 5.5

8. Which of the following graphs could represent the function $y = x^2 + 2$?

A. 

B. 

C. 

D. 

9. Sally's six year old daughter is prescribed cough medicine with an adult dose of 11mL.

Using Young's Formula, calculate the amount of cough medicine Sally should give to her daughter.

$$Young's\ Formula\ = \frac{age\ of\ child\ in\ years \times adult\ dosage}{age\ of\ child\ in\ years + 12}.$$

A. 0.92 mL
B. 3.67 mL
C. 11 mL
D. 66 mL

10. Luke owns 500 ordinary shares and 250 preference shares.

The current prices of the ordinary shares and preference shares are \$6.80 and \$4.70 respectively.

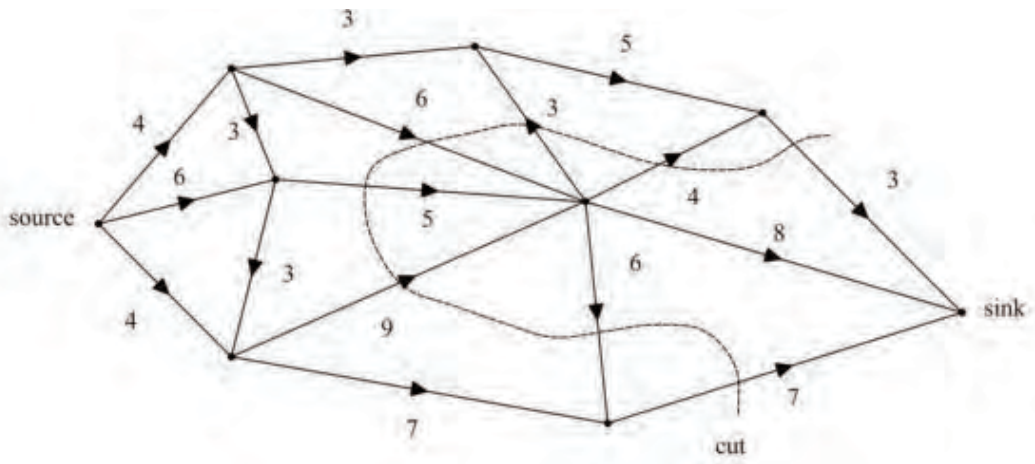
The dividend on the ordinary shares is 35¢ and on the preference share is 4%. Calculate Luke's total dividend.

A. \$50
B. \$175
C. \$185
D. \$222

11. If a scatterplot has a correlation coefficient of $r = -0.62$, it can be described as:

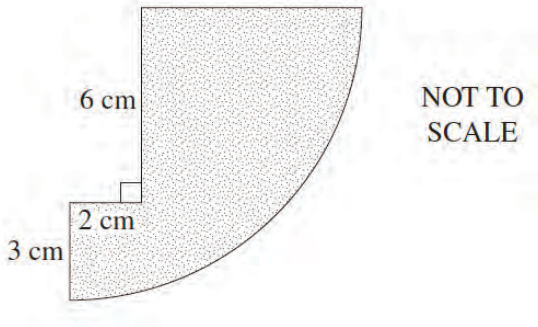
A. a weak positive correlation
B. a weak negative correlation
C. a strong positive correlation
D. a moderate negative correlation

12. For the network below, the capacity of the cut shown is:



A. 23
B. 30
C. 34
D. 41

13. The shaded region shows a quadrant with a rectangle removed.



What is the area of the shaded region, to the nearest cm^2?

A. 38 cm^2
B. 52 cm^2
C. 61 cm^2
D. 70 cm^2

14. This is a table of compound interest values for $1

Compounded values of $1						
period	*Interest rate per period*					
	1%	2%	4%	5%	8%	10%
1	1.010	1.020	1.040	1.050	1.080	1.100
2	1.020	1.040	1.082	1.103	1.166	1.210
3	1.030	1.061	1.125	1.158	1.260	1.331
4	1.041	1.082	1.169	1.216	1.360	1.464
5	1.051	1.104	1.217	1.276	1.469	1.611

$22000 is invested and compounded annually at 5%.

Using the table, what is the value of the investment after 4 years?

A. $25 476
B. $25 718
C. $26 752
D. $26 774

15. A 140cm television with an energy rating of 7 stars, consumes 213kWh/year.

The same size television with an energy rating of 3 stars, consumes 520kWh/year.

If energy costs are 28.55 cents/kWh, what is the approximate saving in energy over a 10-year period by using the 7-star rated television, compared to the 3-star rated television?

A. $876
B. $1020
C. $1142
D. $3500

End of Section I

Section II. **Start a new page**
Answer on one side only of lined A4 paper

Question 16 (2 marks)

Solve the equation: $x = \frac{(y^2 - y)}{8}$ for x, if $y = 4$. **2**

Question 17 (4 marks)

The number of Year 12 students who completed 30 minutes of exercise for each of the past ten days was as follows:

10 12 14 11 13 16 17 30 20 15

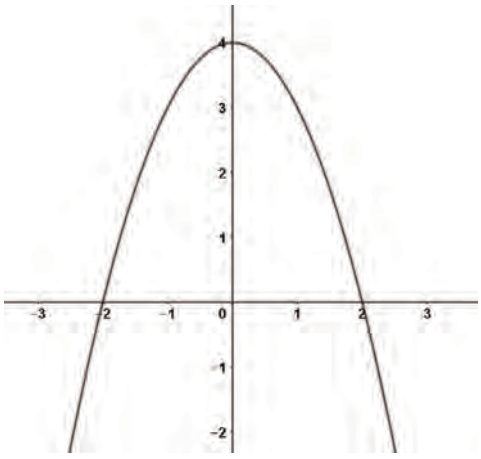
(a) What is the median? **1**

(b) Find the interquartile range. **1**

(c) Is 30 an outlier for this set of data? Justify your answer with calculations. **2**

Question 18 (2 marks)

A graph of a parabola is shown.

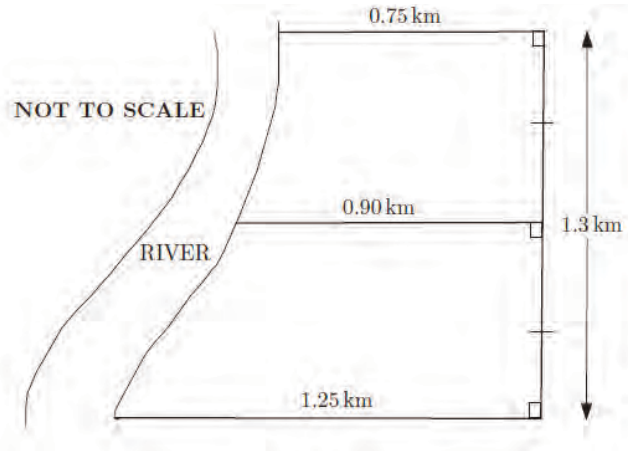


(a) Find the co-ordinates of the vertex **1**

(b) State the co-ordinates of the $x-$ intercepts. **1**

Question 19 (4 marks)

The diagram represents an irregularly shaped paddock between a road and a river.



(a) Use two applications of the trapezoidal rule to estimate the area of the paddock in square metres. **2**

(b) Annual rates payable to the local council are charged at the rate of 0.125 cents per square metre. Calculate the annual rates due for this property. **2**

Question 20 (3 marks)

The table below shows the **monthly repayments** for a reducing balance loan. **3**

Term	Amount of the loan			
	$100 000	$150 000	$200 000	$250 000
12 years	$1664	$2096	$2794	$3493
13 years	$1700	$2150	$2856	$3569
14 years	$1726	$2218	$2898	$3622

Calculate the amount of **interest** paid on a loan of $250 000 over 14 years.

Question 21 (2 marks)

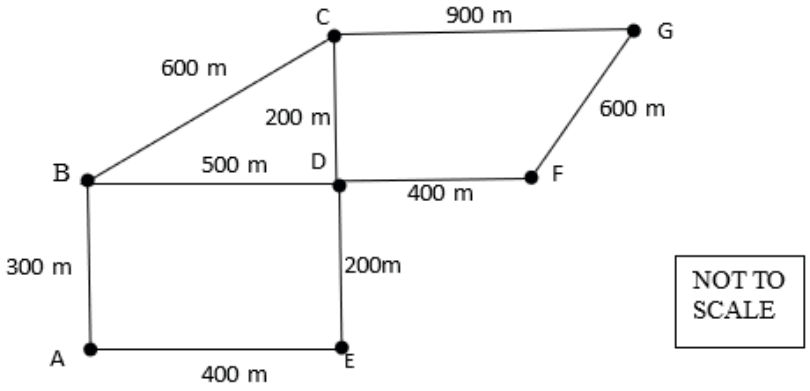
Steven is fishing in a pond containing 32 goldfish, 12 minnow and 8 perch. **2**

After each catch, Steven releases the fish back into the pond.

If Steven plans to catch 25 fish, how many would he expect to be minnows?

Question 22 (2 marks)

The diagram below shows the proposed rod system for a new neighbourhood.

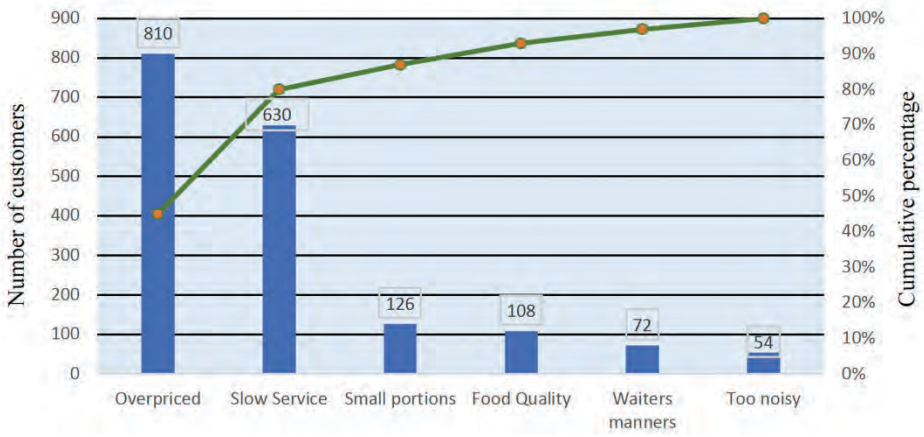


The council wishes to lay power cables that will connect all points in the neighbourhood. **2**

By drawing a minimum spanning tree, calculate the minimum length of cable required.

Question 23 (2 marks)

A restaurant owner collected data related to the reasons given by customers for being unhappy with his restaurant. The Pareto chart shows the data collected.



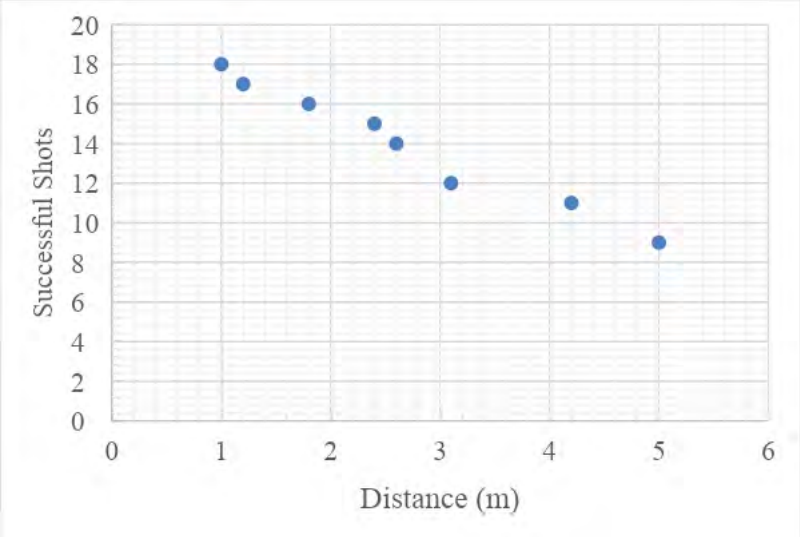
(a) How many customers were surveyed? **1**

(b) What percentage of customers were unhappy because of the small portions? **1**

Question 24 (5 marks)

A netball player took 20 shots from each of 8 different positions that were different distances from the goal. The results are shown in the table below.

Distance (d metres)	1.2	2.4	5.0	4.2	1.0	1.8	3.1	2.6
Successful Shots (s)	17	15	9	11	18	16	12	14



(a) Using the scatterplot, describe the correlation between the two variables. **1**

(b) Calculate Pearson's correlation coefficient for this data. Give your answer correct to 3 decimal places. **1**

(c) Determine the equation of the least-squares regression line for this data, rounding any values to 2 decimal places.
Give your linear equation in the form $s = md + c$. **1**

(d) Using your equation from part (c), predict the distance at which the netball player will make 10 successful shots. **2**

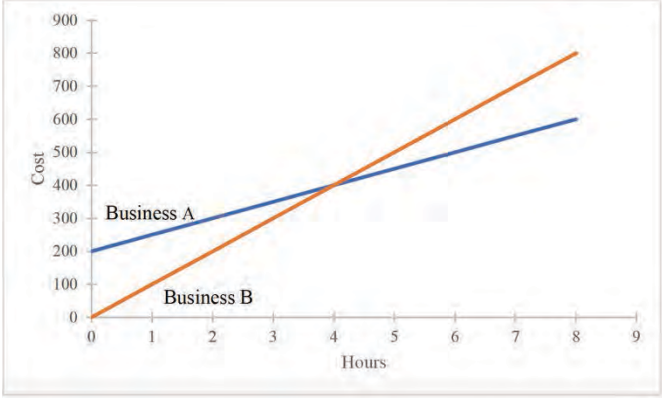
Question 25 (2 marks)

Amanda uses 960 kilocalories of energy per hour while she is doing her swimming training. She eats a crispy chicken wrap that contains 2 060 kilojoules of energy. **2**
How many minutes will she need to swim to use up all the energy from the wrap?
Give your answer correct to the nearest minute. (1 kilocalorie = 4.184 kilojoules)

Question 26 (4 marks)

Jim wants to get his lawn mown and asks two local businesses for their prices. Business A charges $200 plus $50 for every hour worked and Company B charges no call out fee but $100 for every hour worked.

This relationship between the cost, C, and the number of hours worked, n, is depicted in the graph below.



(a) Develop a pair of simultaneous equations to show cost for hours worked. Give your answers in the form $C = mn + c$. **2**

(b) By using the graph, estimate the time at which both businesses will charge the same amount to mow Jim's lawn. **1**

(c) At the time you found in part (b), what is the cost to mow Jim's lawn? **1**

Question 27 (3 marks)

A supermarket receipt is shown below.

BEST SUPERMAKET
Receipt

Bread	$5.50
*Cat food tins	P
*Lolly bags	Q
Total for 3 items	$38.50
GST included in total	$3.30

*GST of 10% is included in the price of item.

Given that the cost of cat food tins is 2.75 times the cost of the lolly bags, determine the missing values P and Q to complete the receipt. **3**

Question 28 (2 marks)

The three angles in a triangle are $(3x)^\circ$, $(5x + 60)^\circ$ and $(60 - 2x)^\circ$. **2**
Find the size of each angle in the triangle.

Question 29 (4 marks)

Calculate the total stopping distance of Josh's BMW travelling at 60km/h in good conditions. Assume Josh has a reaction time of 2.5 seconds and use the formula for braking distance $d = 0.01v^2$, where d is the braking distance in metres and v is the speed in km/h. Give your answer correct to the nearest metre. **4**

Question 30 (8 marks)

(a) Natalie has a gross income of \$1585 per fortnight. **1**
Show that Natalie's gross income for the year is \$41210.

(b) Natalie donates \$50 to charity each month and spends \$108 on work related expenses throughout the year. **1**
Show that Natalie can claim \$708 in tax deductions per year.

(c) As well as her wages, Natalie receives dividends of \$106 throughout the year and receives 1.2% simple interest on a savings account with a balance of \$212 005. **2**
Show that Natalie's taxable income is approximately \$43 152.

(d) The Medicare levy in Australia is calculated at 2% of taxable income. **1**
Find the amount of Natalie's Medicare levy.

The table below shows different tax rates payable in Australia according to taxable income.

Taxable income (\$)	*Tax payable*
\$0 - \$18 200	Nil
\$18 201 - \$37 000	19 cents for each \$1 over \$18 200
\$37 001 - \$90 000	\$3752 plus 32.5 cents for each \$1 over \$37 000
\$90 001 - \$180 000	\$20 797 plus 37 cents for each \$1 over \$90 000
Over \$180 001	\$54 097 plus 45 cents for each \$1 over \$180 000

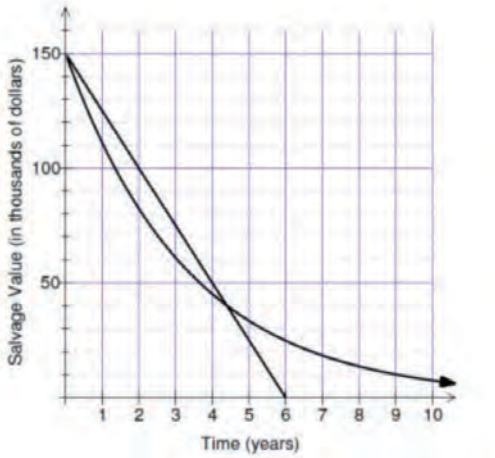
(e) If Natalie has already paid \$6887 in tax, will she receive a refund or owe money? Justify your answer with calculations. **3**

Question 31 (4 marks)

Magda and Ed both purchased office equipment with an initial value of $150 000.

Magda uses the declining balance method to calculate the depreciation of her office equipment and Ed uses the straight-line depreciation method.

The graph below shows the depreciation of Magda and Ed's office equipment.



(a) After approximately how many years does Magda and Ed's equipment have the same salvage value? **1**

(b) What is the approximate value of Magda's office equipment after 3 years? **1**

(c) Find the amount of depreciation per year of Ed's equipment. **1**

(d) Using your answer from (c), find the equation of the straight-line depreciation for Ed's office equipment. **1**

Question 32 (3 marks)

Shane owns a credit card that has no annual fees and charges 19.71% per annum compound interest on all purchases. The interest is charged daily from the day of purchase and includes the day of payment.

(a) Show that the daily interest rate is 0.054%. **1**

(b) On 28 March, Shane bought a painting for $580 using his credit card. **2**

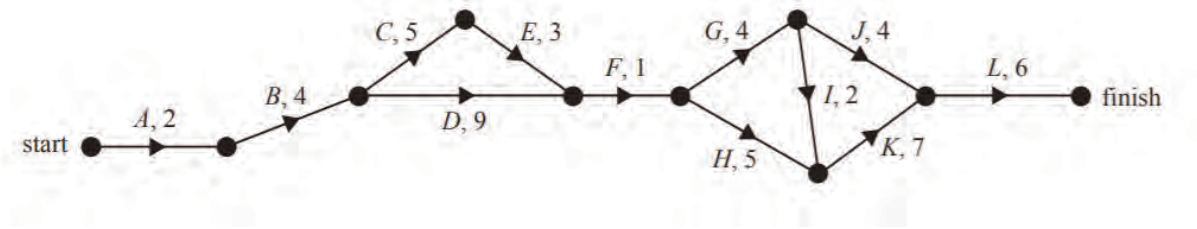
He paid his credit card account on 10 April.
Calculate the total amount Shane paid for the painting, including interest, correct to the nearest cent.

Question 33 (3 marks)

Kambala is planning to renovate its gymnasium.

The project involves 12 activities, A to L.

The directed network below shows these activities and their completion times, in weeks.



The minimum completion time for the project is 35 weeks.

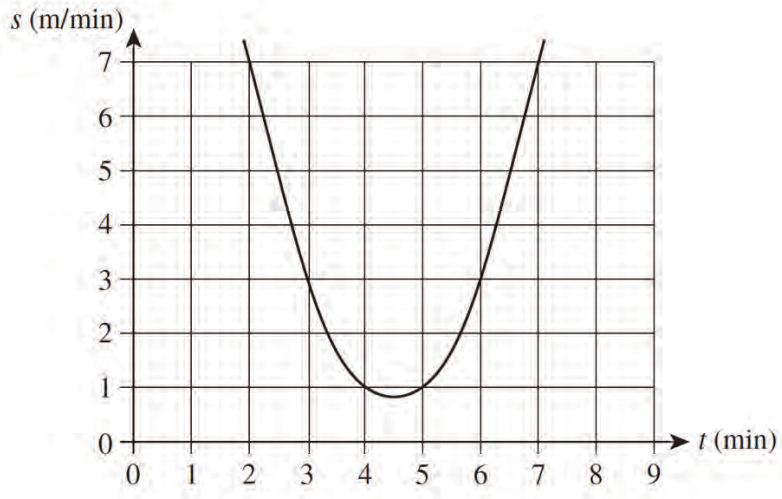
(a) How many activities are on the critical path? **1**

(b) Determine the latest start time of activity E. **1**

(c) Which activity has the longest float time? **1**

Question 34 (3 marks)

The relationship between speed, s, in metres per minute, and time, t, in minutes, for a motor vehicle is modelled by the formula $s = t^2 - 9t + 21$ as shown in the graph.



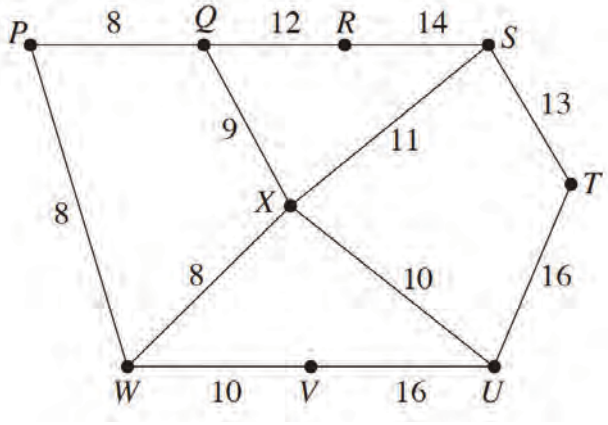
(a) What is the speed when the time is 2.5 minutes? **1**

(b) What time achieves the lowest speed? **1**

(c) Determine the time(s) required to achieve a speed of 3 metres per minute. **1**

Question 35 (6 marks)

The network diagram shows the time (in minutes) taken to travel between towns.



(a) What is the time taken to travel $PQRSX$? **1**

(b) What is the degree of vertex U? **1**

(c) Find the shortest time it would take to travel from P to T. **2**

(d) When Matt travelled between P and T he needed to visit U on the way. **1**
What is the shortest time it would take to travel from P to T visiting U?

(e) Find a minimum spanning tree for this network. **1**

Question 36 (4 marks)

Lisa mixes petrol and oil in the ratio 40: 1 to make fuel for her leaf blower.

a) Lisa pours 5 litres of petrol into an empty container to make fuel for her leaf blower. **1**

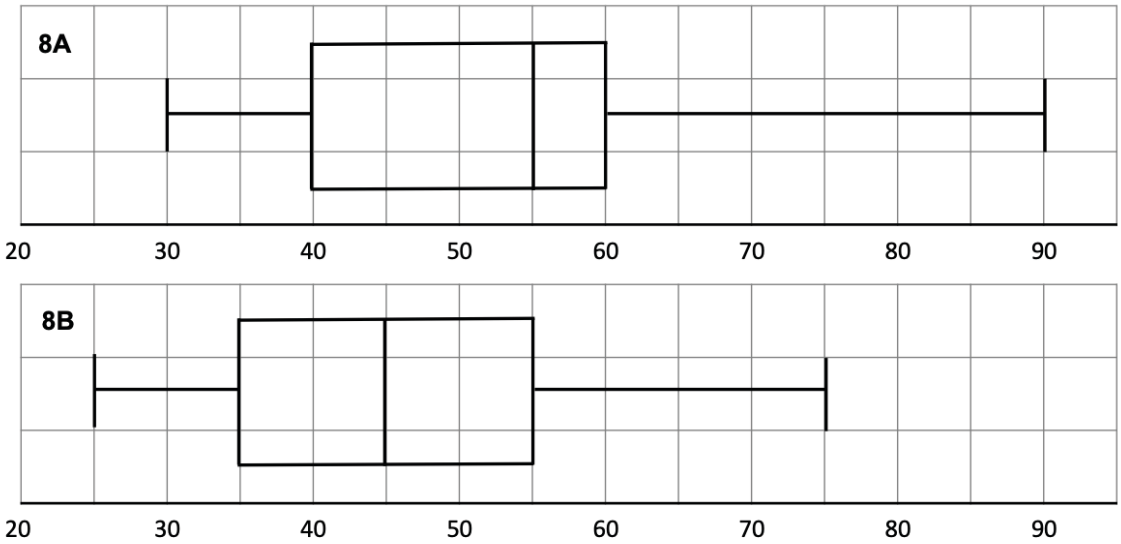
How much oil should she add to the petrol to ensure the fuel is in the correct ratio?

b) Lisa has 4.1 litres of fuel left in her container after filling her leaf blower. **3**
She wishes to use this fuel in her lawnmower. However, her lawnmower requires the petrol and oil to be mixed in the ratio 25: 1.

How much oil should she add to the container so that the fuel is in the correct ratio for her lawnmower?

Question 37 (5 marks)

Two classes, 8A and 8B, collect data on the time it takes students to get to school. This information has been summarised in the box and whisker plots below.



a) Consider the table below. **3**

Class	8A	8B
Median	A	D
Interquartile Range	B	E
Range	C	F

Write down the values of A, B, C, D, E and F.

b) Which class was the most consistent overall? Justify your answer with mathematical reasoning. **2**

Question 38 (4 marks)

The formula below can be used to estimate the blood alcohol content (BAC) for males. **4**

$$BAC_{male} = \frac{10N - 7.5H}{6.5M}$$

where N is the number of standard drinks consumed, H is the number of hours drinking and M is the person's weight in kilograms.
The number of hours required for a person to reach a zero BAC after they stop drinking alcohol is given by the formula:

$$\text{Time} = \frac{BAC}{0.015}$$

The number of standard drinks is as shown in the table.

	Number of standard drinks
Wine	1.2
Beer	1
Spirit	1

Elijah was out on Saturday night celebrating his team's win. The celebrations started at 8pm and continued until the team's 12:30am curfew. During this time he consumed 8 beers and 3 shots of spirits. He then stopped drinking alcohol.

Using the information and the formulae above, and the fact that Elijah weighs 110kg, determine what time and day his BAC should reach zero.

Question 39 (4 marks)

Stephanie invested \$9 200 in an account that earned \$1 380 interest after 5 years. **4**

The interest was compounded monthly.

Find the annual interest rate, as a percentage, correct to 1 decimal place.

End of Examination

Kambala
2021 Mathematics Standard 2
Trial Examination
SOLUTIONS

Section I

1. Sydney = +10
   Mexico = −5

∴ Sydney is 15 hours ahead of Mexico.

∴ 8am Monday in Sydney
∴ Mexico = (24 + 8) − 15 hours on Sunday
= (32 − 15) on Sunday
∴ 17 hours Sunday
∴ 5pm Sunday in Mexico (A)

2. Ordinal (A)

3. 103 km/hour
= 103 000 m/hour
= $\frac{103000}{60}$ m/min
= $\frac{103000}{60 \times 60}$ m/sec

= 28.6 m/sec (1 dec. pl.) (C)

4. Absolute error $= \frac{1}{2} \times$ precision
$= \frac{1}{2} \times 1\text{hr}$
$= 0.5\text{ hr}$

Percentage error $= \frac{0.5}{14} \times 100$

$\doteq 3.57143\%$
$= 3.57\%$ (2 dec. pl.) (C)

5. $m = -\frac{1}{3}$

$c = 1$

$\therefore$ equation in form $y = mx + c$
is $y = -\frac{1}{3}x + 1$ (D)

6. 6.52am train (C)

7.

x	f	cf	fx
1	2	2	2
3	4	6	12
5	6	12	30
7	8	20	56
	$\Sigma f = 20$		$\Sigma fx = 100$

$\bar{x} = \frac{\Sigma fx}{\Sigma f}$ or use calculator $\bar{x} = 5$

$= \frac{100}{20}$

$= 5$

(C)

8. $y = x^2 + 2$
- concave up with y-intercept 2

(B)

9. Young's formula $= \frac{\text{age of child} \times \text{adult dose}}{\text{age of child} + 12}$

$= \frac{6 \times 11}{6 + 12}$

$= \frac{66}{18}$

$= \frac{11}{3}$

$\doteqdot 3.67\text{mL}$

(B)

10. Ordinary shares dividend $= 500 \times 35¢$
$= \$175$

Total value of preference shares $= 250 \times \$4.70$
$= \$1175$

Preference shares dividend $= 4\% \times \$1175$
$= \$47$

$\therefore$ Total dividends $= \$175 + \$47$
$= \$222$

(D)

11. $r = -0.62$
$r < 0 \therefore$ negative correlation
$0.62 \Rightarrow$ moderate

$\therefore$ moderate negative correlation

(D)

12. Capacity of cut $= 7+9+5+6+3$
$= 30$ (B)

13. Area $= \frac{1}{4}\pi r^2 - lw$

$= \frac{1}{4}\pi(3+6)^2 - 2\times 6$

$= \frac{1}{4}\pi(9)^2 - 12$

$= \frac{81\pi}{4} - 12$

$\doteq 51.617 \text{ cm}^2$

$= 52 \text{ cm}^2$ (to nearest cm^2) (B)

14. 5% over 4 years gives a value of 1.216
$\therefore$ \$22000 will grow to $1.216 \times \$22000$
$= \$26752$ (C)

15. 7 star: $213 \times 28.55¢$ per year
$= \$60.8115$
$= \$608.12$ in 10 years

5 star: $520 \times 28.55¢$ per year
$= \$148.46$
$= \$1484.60$ in 10 years

Total savings $= \$1484.60 - \$608.12$
$= \$876.48$
$\doteq \$876$ (A)

Section II

Question 16

$$x = \frac{y^2 - y}{8}$$

when $y = 4$, $x = \frac{(4)^2 - 4}{8}$

$$x = \frac{16-4}{8}$$

$$x = \frac{12}{8}$$

$$x = 1.5$$

Question 17

10 12 14 11 13 16 17 30 20 15

Scores in order: 10 11 12 12 13 14 | 15 16 17 17 20 30

a) median $= \frac{14+15}{2}$

$= \frac{29}{2}$

$= 14.5$

b) IQR $= 17 - 12$

$= 5$

c) Outliers $> 17 + 1.5(5)$

$= 17 + 7.5$

$[Q_3 + 1.5\text{IQR}] = 24.5$

Since 30 is more than 24.5, it would be considered an outlier

Question 18

a) vertex is $(0, 4)$

b) x-intercepts at $(-2, 0)$ and $(2, 0)$

Question 19

$$h = \frac{1.3\text{km}}{2}$$
$$= 0.65\text{km}$$
$$= 650\text{m}$$

$$A \doteq \frac{h}{2}[d_F + d_L]$$
$$\doteq \frac{650}{2}[1250 + 900] + \frac{650}{2}[900 + 750]$$
$$\doteq 325(2150) + 325(1650)$$
$$\doteq 698750 + 536250$$
$$\doteq 1{,}235{,}000\ m^2$$

b) Rates $= 1235000 \times 0.125^c$
$= 154375^c$
$= \$1543.75$

Question 20

Monthly repayments on \$250000 over 14yrs = \$3622

$\therefore$ Total repaid = $14 \times 12 \times \$3622$
= \$608496

$\therefore$ Interest paid = \$608496 − \$250000
= \$358496

Question 21

32 goldfish, 12 minnow, 8 perch

$\therefore$ Number of fish = 32 + 12 + 8
= 52

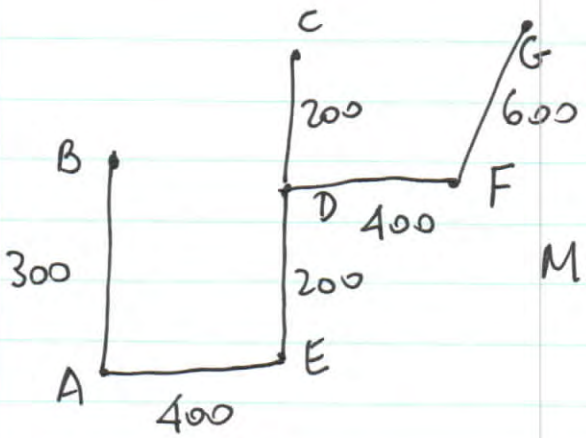
$\therefore$ Expect $\frac{12}{52}$ to be minnows

$\therefore \frac{12}{52} \times 25$

$\doteq 5.769$

$\therefore$ Steven would expect to catch 6 minnows.

Question 22



Minimum spanning tree

Length of cable = 300 + 400 + 200 + 200 + 400 + 600
= 2100m

Question 23

a) Number of customers = 900 (see 100% on graph)

b) % of customers = % difference between slow service and small portions
= 89% - 81%
= 8%

Question 24

a) Strong negative correlation

b) $r \doteq -0.98805$
$\therefore r = -0.988$ (to 3 dec. pl.)

c) Equation of line is $s = -2.2d + 19.9$
(from calculator)

d) $s = -2.2d + 19.9$
When $s = 10$, $10 = -2.2d + 19.9$
$\therefore -9.9 = -2.2d$
$\therefore d = \frac{-9.9}{-2.2}$

$d = 4.5$
$\therefore$ The player should make 10 successful shots when they are 4.5 metres from the goal.

Question 25

Chicken wrap contains 2060 kJ
$= (2060 \div 4.184)$ kcal
$\doteq 492.35181164$ kcal

Time of swimming $= (960 \div 492.3518)$ hours
$\doteq 1.9498$ hours
$= 116.99$ minutes
$= 117$ minutes (to nearest minute)

Question 26

a) Business A: $C = 50n + 200$
Business B: $C = 100n$

b) Both will charge the same amount at 4 hours

c) The cost to mow the lawn will be $400

Question 27

$5.50 + P + Q = 38.50$
$\therefore P + Q = 33$
but $P = 2.75Q$
$\therefore 2.75Q + Q = 33$
$\therefore 3.75Q = 33$
$Q = 8.8$
$\therefore P = 2.75 \times 8.8$
$= 24.2$

$\therefore P = \$24.20$ and $Q = \$8.80$

Question 28

$3x + 5x + 60 + 60 - 2x = 180$ (angle sum triangle)
$3x + 5x - 2x + 60 + 60 = 180$
$6x + 120 = 180$
$6x = 60$
$x = 10$
$\therefore 3x = 30°$, $5x + 60 = 110°$, $60 - 2x = 40°$
$\therefore$ The angles are $30°$, $110°$, $40°$

Question 29

Stopping distance = braking distance + reaction time distance

Speed = 60km/h
= 1km/min
= $\frac{1}{60}$ km/sec
= $\frac{1}{60} \times 2.5$ in 2.5 seconds
= $0.041\dot{6}$ km
= $41.\dot{6}$m in 2.5 seconds

$\therefore$ Stopping distance = $41.\dot{6}$m

Braking distance : $d = 0.01v^2$
$\therefore d = 0.01(60)^2$
$= 0.01(3600)$
$= 36$m

$\therefore$ Stopping distance = $41.\dot{6}$m + 36m
$= 77.\dot{6}$m
= 78m (to nearest metre)

Question 30

a) Gross income = $26 \times \$1585$
$= \$41210$

b) Tax deductions = $\$50 \times 12 + \$108$
$= \$600 + \$108$
$= \$708$

c) Interest = $1.2\% \times \$212005$
$= \$2544.06$

Taxable income = income − deductions
$= \$41210 + \$106 + \$2544.06 - \$708$
$= \$43152.06$
$\doteq \$43152$

(Note: taxable income never includes cents)

d) Medicare levy = $2\% \times \$43152$
$= \$863.04$

e) Income tax = $\$3752 + \$(43152 - 37000)(\$0.325)$
$= \$3752 + \$6152(\$0.325)$
$= \$3752 + \$1999.40$
$= \$5751.40$

∴ Total tax = $\$5751.40 + \$863.04$
$= \$6614.44$

Natalie has already paid more than this
∴ Refund = $(\$6887 - \$6614.44)$
$= \$272.56$

∴ Natalie will receive a refund of $\$272.56$

Question 31

a) The salvage value will be the same after $4\frac{1}{2}$ years

b) Value $\doteqdot 60 \times \$1000$
$\doteqdot \$60000$

c) $S = V_0 - D_n$
$100000 = 150000 - 2D$
$-50000 = -2D$
$D = \$25000$

or $S = V_0 - D_n$
$0 = 150000 - 6D$
$6D = 150000$
$D = \$25000$

$\therefore$ Depreciation is \$25000 per year

d) $D = \$25000$
$\therefore$ Equation is $S = V_0 - Dn$
$\therefore S = 150000 - 25000n$

Question 32

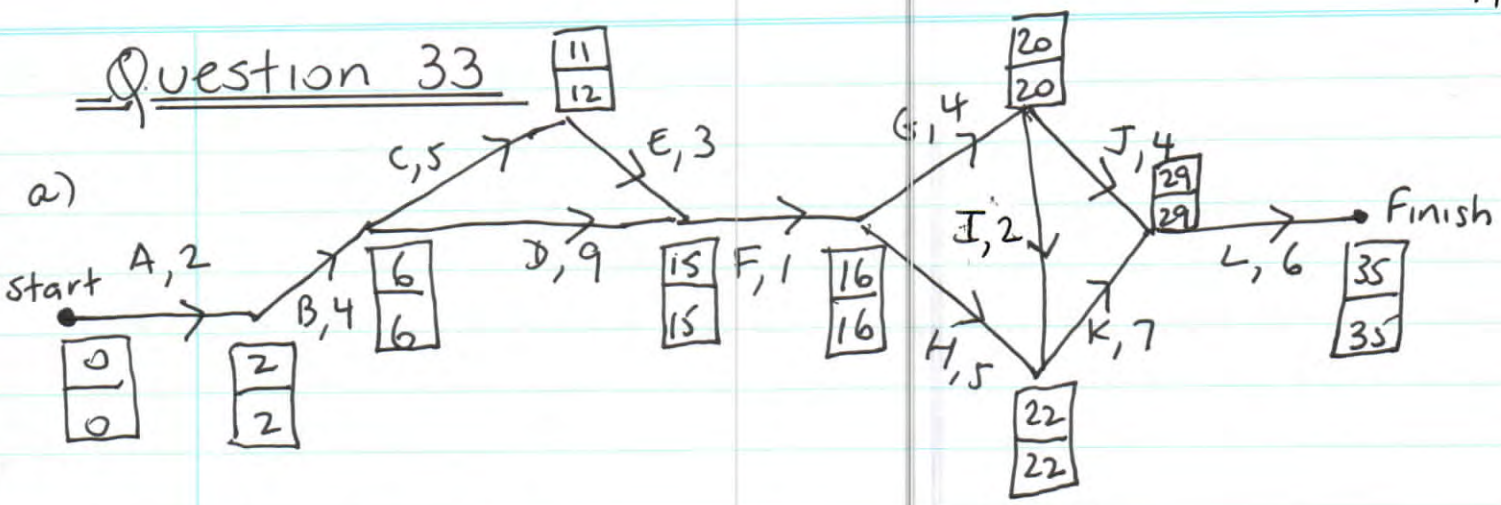
a) Interest = 19.71% pa
$= \frac{19.71}{365}$ % per day

$\doteqdot 0.054\%$ per day

b) 28 March to April 10 inclusive = 14 days
Payment $= \$580 + 14 \times \frac{0.054}{100} \times \$580$
$= \$580 + \$4.38$
$= \$584.38$
$\therefore$ Shane paid \$584.38 for the painting

Question 33

a)



Float Times

A: 2 - 0 - 2 = 0
B: 6 - 2 - 4 = 0
C: 12 - 6 - 5 = 1 *
D: 15 - 6 - 9 = 0
E: 15 - 11 - 3 = 1 *
F: 16 - 15 - 1 = 0
G: 20 - 16 - 4 = 0
H: 22 - 16 - 5 = 1 *
I: 22 - 20 - 2 = 0
J: 29 - 20 - 4 = 5 *
K: 29 - 22 - 7 = 0
L: 35 - 29 - 6 = 0

* not critical

∴ There are 8 activities on the critical path.

b) Latest start time for activity E is 12 weeks

c) Activity J has the longest float time of 5 weeks

Question 34

a) When $t = 2.5$, $s = 4.75$ metres/min (accept $s = 5$, $s = 4.5$)

b) Lowest speed when $t = 4\frac{1}{2}$ minutes

c) Speed of 3 metres/min occurs when $t = 3$ minutes and $t = 6$ minutes

Question 35

a) PQRSX = 8 + 12 + 14 + 11
= 45 minutes

b) Vertex U has degree 3

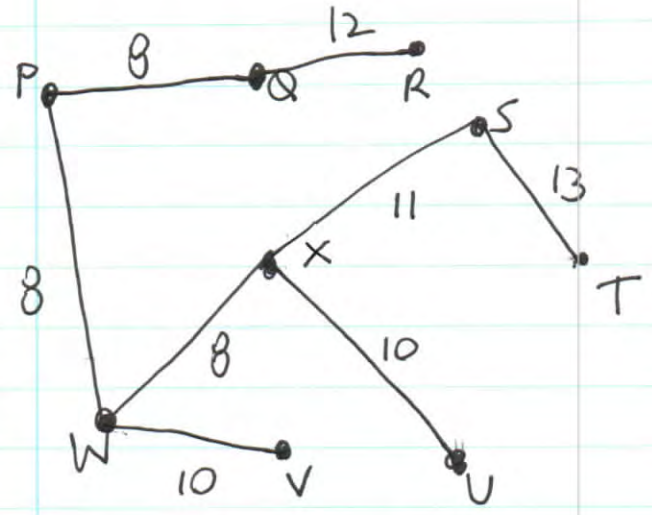
c) PQRST = 47
PQXST = 41
PQXUT = 43
PWXST = 40
PWXUT = 42
PWVUT = 50

Check PQXWVUT = 67
PWXQRST = 64

∴ The shortest time from P to T takes 40 minutes using PWXST.

d) Of the paths between P and T which visit U on the way, the shortest is PWXUT, which takes 42 minutes.

e)



Question 36

Petrol : Oil
= 40 : 1

a) P : O
= 40 : 1
= 1 : $\frac{1}{40}$

$\therefore$ 5L : $5 \times \frac{1}{40}$ L

= 5L : 0.125L

$\therefore$ 125mL oil needs to be added

b) P : O for leafblower = 40 : 1

$\therefore \frac{40}{41}$ = petrol, $\frac{1}{41}$ = oil

4.1L left $\Rightarrow \frac{40}{41} \times 4.1$L petrol, $\frac{1}{41} \times 4.1$L oil

$\therefore$ 4L petrol : 0.1L oil

Lawnmower P : O
= 25 : 1
= 1 : $\frac{1}{25}$
$\therefore$ 4L : $4 \times \frac{1}{25}$ L

$\therefore$ need 0.16L oil for 4L petrol

Lisa already has 0.1L oil

$\therefore$ Need to add (0.16 − 0.1)L oil

$\therefore$ Need to add 0.06L oil
$\therefore$ Need to add 60mL oil

Question 37

a) A = 55
B = 60 − 40
= 20
C = 90 − 30
= 60

D = 45
E = 55 − 35
= 20
F = 75 − 25
= 50

b) Class BB was the most consistent overall. Both classes have the same IQR, but Class BB has a smaller range and the differences $Q_2 - Q_1$ and $Q_3 - Q_2$ are the same, with only $Q_4 - Q_3$ being larger. In Class BA, the differences between the quartiles are much larger.

Question 38

$$BAC = \frac{10N - 7.5H}{6.5M}$$

$$= \frac{10(11) - 7.5(4.5)}{6.5(110)}$$

$$= \frac{110 - 33.75}{715}$$

$\therefore BAC \doteq 0.106643356$

$$Time = \frac{BAC}{0.015}$$

$$= \frac{0.106643356}{0.015}$$

$= 7.10955711$

$=$ 7 hours and 7 minutes

7 hours 7 minutes after 12.30am Sunday is 7.37am Sunday

$\therefore$ BAC should reach zero at about 7.37am Sunday

Question 39

$PV = \$9200$
$I = \$1380$
$n = 5$ years
$= 60$ months

$FV = PV + I$
$= 9200 + 1380$
$= \$10580$

$FV = PV(1+r)^n$
$10580 = 9200(1+r)^{60}$
$1.15 = (1+r)^{60}$

$\sqrt[60]{1.15} = 1+r$

$1.00233208 1 = 1+r$

$\therefore r = 0.00233208 1$
$\therefore r \doteq 0.2332\%$ per month

$\therefore r \doteq 2.7895\%$ pa

$\therefore$ The annual interest rate is 2.8% pa (to 1 dec. pl.)