Answer all the questions.

1. (a) Solve the equation $x(3x - 8) = -3$

[2]

(b) Given that $\frac{v}{3} = \sqrt{\frac{2(2s-v)}{s+3}}$, make the subject, v in terms of v.

[3]

(c) Express $\frac{1}{4x^2-11x-3} - \frac{3}{4x+1} - \frac{2}{3-x}$ as a single fraction in its simplest form.

[4]

2. (a) Mike bought a new car at a selling price of $109,000.

He paid 40% of the selling price in cash and took a 5-year loan for the rest of the amount. If the bank charges 2.8% of simple interest per annum for the loan.

Calculate

(i) the total interest payable,

[2]

(ii) to amount Mike has to pay per month for the loan.

[2]

(b) Mike's new car uses fuel at an average rate of 9.5 litres per 100 km driven.

In an average year, Mike drives 15,000 km. The retail price of fuel is $2.25 per litre and Mike has a loyalty card that gives him 10% discount off the retail price.

Assuming that the price of feul remains the same through out the whole year.

Calculate the amount Mike would expect to spend on fuel in one year, correct to the nearest dollar.

[2]

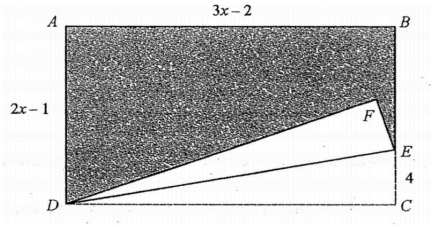
(c) The original value of the car is its selling price of $109,000.

For each of the first 5 years, the value of the car decreases by 13% of its value at the start of every year.

After 3 years, Mike decides to sell the car. Calculate tge overall percentage reduction in the value of the car compared with its original value, giving your answer to 2 decimal place (d.p.).

[3]

3. A rectangular piece of paper $ABCD$ is folded along the line ED such that C is moved to F. The length of AB is $(3x - 2)$ cm, AD is $(2x - 1)$ cm and EC is 4 cm.



(a) Write down an expression, in terms of x, for

(i) area of rectangle $ABCD$,

[1]

(ii) area of the triangle DEF.

[1]

(b) Given that the area of the shaded region $ABEFD$ is $184\ cm^2$.

Form an equation in x and show that it reduces to $6x^2 - 19x - 174 = 0$.

[2]

(c) Solve $6x^2 - 19x - 174 = 0$, giving your answer correct to 3 d.p..

[3]

(d) Find the perimeter of the folded piece of paper.

[2]

4. (a) P is the point $(2, 1)$. The position vector of Q is $\begin{pmatrix} -3 \\ 6 \end{pmatrix}$.

(i) Write down the column vector $\overrightarrow{PQ}$.

[1]

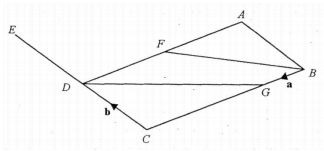
(ii) Find the exact value of $|\overrightarrow{PQ}|$.

[2]

(iii) Find the position vector of R, such that $\overrightarrow{QR} = 3\overrightarrow{QP}$.

[2]

(b) $ABCD$ is a parallelogram and E lies on CD produced such that $CD = DE$. F is the midpoint of AD and G is a point on BC such that $BG : GC = 1 : 3$. Given $\overrightarrow{BG} = a$ and $\overrightarrow{CD} = b$,



(i) express $\overrightarrow{DF}$, $\overrightarrow{BF}$ and $\overrightarrow{BE}$ in the simplest form, in terms of a and b,

[3]

(ii) Make two statements about B, F and E.

[2]

(iii) Find the numerical value of

(1) $\frac{area\ of\ \triangle ABC}{area\ of\ \triangle DCG}$

[2]

(2) $\frac{area\ of\ \triangle ABC}{area\ of\ quadrilaterial\ FBGD}$

[2]

5. (a) Part of the unilities bill for July of a household is shown below.

Water Services by Public Utilities Board			
	Usage	Rate	Amount ($)
Water	4.7 Cu M	$ 1.1700	5.50
Waterborne Fee	4.7 Cu M	$ 0.2803	
Water Conservation Tax		30%	
⋮			
Goods & Services Tax (GST)		7%	

(i) Find the water conservation tax for this bill.

[2]

(ii) Calculate the total charges for water usage for this household, icluding GST.

[2]

(iii) The value in part (ii) is 12% of the entire unilities bill. Find the total charges for the month of July.

[2]

(b) A supermarket has three check-out counters Manned by Abby, Brian and Chloe. The following table shows the number of note of denomination $\$2$, $\$10$ and $\$50$ in their cash registers at the end of a business day.

	$\$2$	$\$10$	$\$50$
Abby	12	10	25
Brian	20	15	30
Chloe	18	8	24

(i) Given that $P = \begin{pmatrix} 12 & 10 & 25 \\ 20 & 15 & 30 \\ 18 & 8 & 24 \end{pmatrix}$ and $Q = \begin{pmatrix} 2 \\ 10 \\ 50 \end{pmatrix}$, evaluate PQ and explain what the elements in this matrix product represent.

[2]

The three cashiers started the day with $\$150$, $\$100$, and $\$180$ in their cash registers respectively.

(ii) Write a 3 by 1 matrix S to represent this information.

[1]

(iii) Write down another matrix T such that a matrix operation involving P, Q, S and T will give the total sales of the supermarket for the day. Hence find the amounts.

[3]

6. The variables x and y are connected by the equation $y = x + \frac{10}{x} - 4$.

Some corresponding values of x and y are given in the table below.

x	**1**	**1.5**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
y	7	a	3	2.3	2.5	3	3.6	4.4	5.25

(a) Calculate the value of a, correct to 2 decimal places.

[1]

(b) Using a scale of 2 cm to represent 1 unit on both axes, plot the points given in the table and join them with a smooth curve.

[3]

(c) Use your graph to find the value of x when the gradient of the curve $y = x + \frac{10}{x} - 4$ is equal to zero.

[2]

(d) (i) On the same axes, draw the graph of the straight line $y = 1 - x$.

[1]

(ii) Hence, use your graph to estimate the coordinates of the point Q on the curve where the gradient of the curve is -1.

[2]

(e) By drawing a suitable straight line on the same axes, use yout graph to find the solutions of the equation $\frac{1}{2}x + \frac{10}{x} - 7 = 0$

[3]

7. On any day, Andrew may go to school by bus, MRT or taxi.

The probability that he takes the bus is $\frac{1}{5}$.

The probability that he takes the MRT is $\frac{3}{4}$.

If he takes bus, the probability that he will be late for school is $\frac{1}{8}$. If he take the MRT, the probability he will be late is $\frac{1}{15}$. He will not be late if he takes taxi to school.

(a) Construct a tree diagram for this information.

[2]

(b) Find the probability

(i) that he goes to school by taxi.

[1]

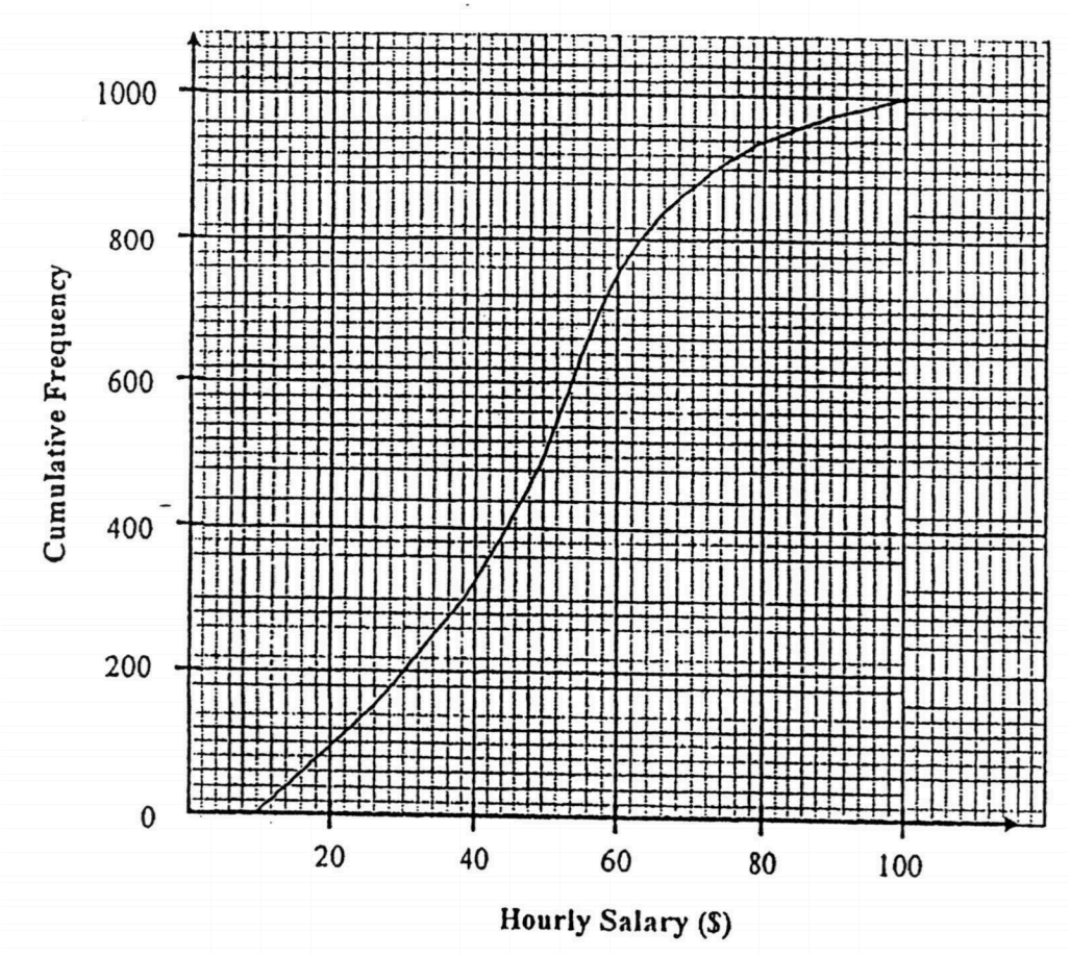
(ii) he will be late for school on any given day.

[3]

(iii) he will not be late for two of three consecutive days.

[3]

8. The cumulative frequency graph shows the distribution of salary of 1000 workers in a company A.



(a) Use the graph to estimate the

(i) median,

[1]

(ii) interquartile range of the distribution,

Answer _____[1]

(iii) 60^{th} percentile,

Answer _____[1]

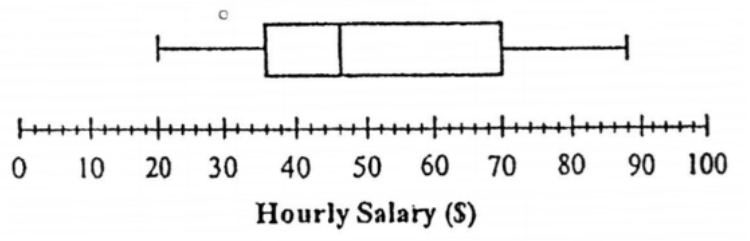
(iv) value of g if 14% of the workers earn more than $\$g$ hourly.

Answer _____[1]

(b) Two workers were selected randomly from the company. Find the probability that one worker selected earns not more than $\$30$ and the other earns more than $\$80$ hourly. Express your answer as a fraction in its lowest term.

[3]

(c) The hourly salary of 1000 workers in company B is illustrated in a box-and-whisker diagram as shown below.



(i) Find the median hourly salary and interquartile range of the distribuion in company B.

[2]

(ii) Compare and comment on the hourly salary of the workers from company A and company B in two different ways.

[2]

9. In a class of 32 children, 18 are Chinese, 8 are Malay, 4 are Indian and 2 are Eurasian. One child is chosen at random from the class. Another child is then chosen at random from the remaining children.

   Using a tree diagram, or otherwise,

   (a) Find the probability that

   (i) the first child chosen is a Chinese and the second child chosen is a Malay.

   [1]

   (ii) the children chosen are both Eurasians,

   [2]

   (iii) at least one of the children chosen is an Indian.

   [3]

   (b) A third child is chosen from the remaining children. Find the probability that three children chosen are of different races, given that the second child chosen is a Chinese.

   [4]

10. (a) Express $x(7-2x)+1$ in the form of $-a(x-p)^2+q$.

[1]

(b) Write down the coordinates of the maximum point of the graph.

[1]

(c) Hence, sketch the graph of the line of $y=x(7-2x)+1$.

[2]

(d) State the equation of the line of symmetry of the graph.

[1]

~ END OF PAPER ~