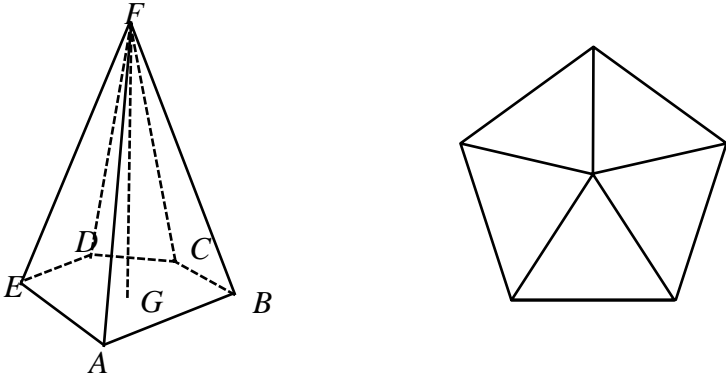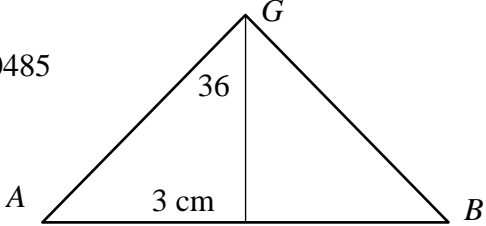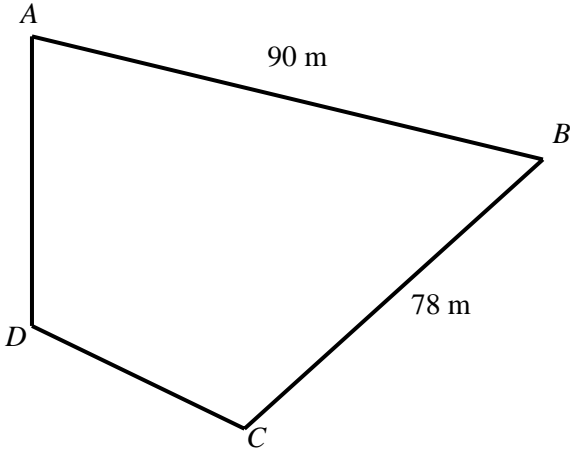| Qn	Solutions	
1	A sequence is given by the formula $P_{n+1} = (P_n)^2 + mP_n$, where m is a constant.	
1a	Given that $P_1 = 3$, show that $P_2 = 3m + 9$.	
	$P_2 = (P_1)^2 + m(P_1)$ $\quad = 3^2 + m(3)$ $\quad = 3m + 9$ (*shown*)	
1b	Given that $P_2 = -\dfrac{3}{4}$, find the value of m,	
	$P_2 = -\dfrac{3}{4}$ $3m + 9 = -\dfrac{3}{4}$ $m = \left(-\dfrac{3}{4} - 9\right) \div 3 = -3\dfrac{1}{4}$ (accept -3.25, $-\dfrac{13}{4}$)	
1ci	By using the answer in **(b)**, find P_3, P_4 and P_5.	
	$P_3 = \left(-\dfrac{3}{4}\right)^2 + \left(-\dfrac{13}{4}\right)\left(-\dfrac{3}{4}\right) = 3$ $P_4 = (3)^2 + \left(-\dfrac{13}{4}\right)(3) = -\dfrac{3}{4}$ $P_5 = \left(\dfrac{3}{4}\right)^2 + \left(-\dfrac{13}{4}\right)\left(-\dfrac{3}{4}\right) = 3$	
1cii	By considering the terms of P_1, P_2, P_3, P_4 and P_5 or otherwise, find the value of P_{2016}.	
	$P_1 = 3$ $P_2 = -\dfrac{3}{4}$ $P_3 = 3$ $P_4 = -\dfrac{3}{4}$ $P_5 = 3$ $P_{2016} = 3(-\dfrac{13}{4}) + 9 = -\dfrac{3}{4}$	

2a	The diagram shows a pyramid *ABCDEFG*. The base of the pyramid is a regular pentagon of side 6 cm. The tip *F* is vertically above the centre of the pentagon, *G*, and $AF = 14$ cm. Calculate the angle *AGB*.	

	angle $AGB = \dfrac{360}{5} = 72°$	
2b	Show that $AG = 5.1039$ cm, correct to five significant figures.	[2]

$$\frac{3}{AG} = \sin 36°$$
$$AG = \frac{3}{\sin 36°} = 5.10390485$$
$$= 5.1039 \text{ cm}$$

2c	Calculate the height of the pyramid, *FG*.	[2]

$$FG^2 = AF^2 - AG^2$$
$$FG^2 = 14^2 - 5.10390485^2 = 169.9501553$$
$$FG = 13.03649321 = 13.0 \text{ cm}$$

2d	The pyramid is the model for a paper weight that is to be gold plated. To reduce costs the pyramid is made smaller such that the smaller pyramid remains geometrically similar to the original pyramid but its height is reduced by 35%. The surface area of the large pyramid is S cm^3. Express the surface area of the new pyramid as a percentage of *S*.	[3]
	$FG = 13.03649321$ cm New height $= 0.65 \times 13.03649321$ $= 8.473720587$ cm	

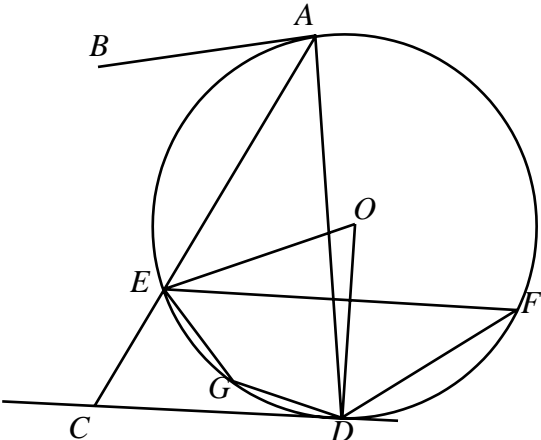|			
	$\dfrac{\text{Surface of small pyramid}}{S} = \dfrac{8.473720587^2}{13.03649321^2} = 0.4225$ Surface of small pyramid $= 0.4225S$ The percentage $= \dfrac{S - 0.4225S}{S} \times 100$ $\qquad\qquad\quad = 57.75\%$		
3i	Given that the points $P(3, k)$, $Q(1, -2)$ and $R(-4, -6k)$ lie on a straight line, find the value of k.		
	Gradient of AB = Gradient of AC $\dfrac{-2 - k}{1 - 3} = \dfrac{-6k - k}{-4 - 3}$ $-7(-2 - k) = -2(-7k)$ $14 + 7k = 14k$ $k = 2$		
3ii	Find the length of the line segment PQ.		
	Length of line segment $PQ = \sqrt{(3-1)^2 + (2 - (-2))^2}$ $\qquad\qquad\qquad\qquad\quad = \sqrt{4 + 16}$ $\qquad\qquad\qquad\qquad\quad = \sqrt{20}$ $\qquad\qquad\qquad\qquad\quad = 4.47$ unit (3s.f)		
4	Quadrilateral $ABCD$ is a field with $AB = 90$ m and $BC = 78$ m and A is due north of D. The bearing of B from A is $100°$, the bearing of B from C is $025°$ and the bearing of D from C is $278°$. 		
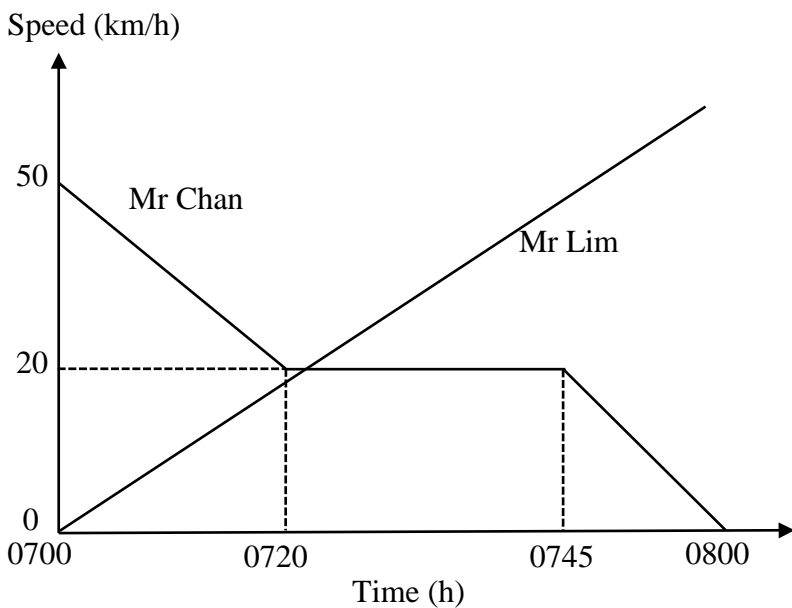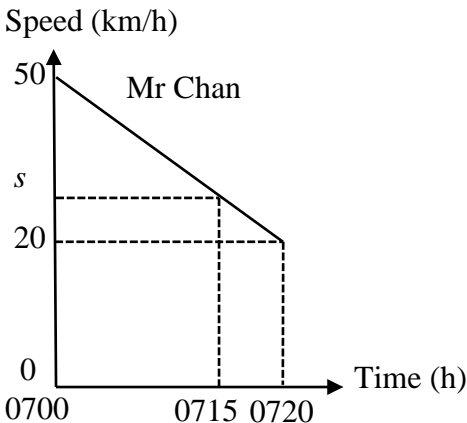
4ai	Show that angle $ABC = 75°$.	
	Draw a north line on point B. Label due south point as E. $\angle EBA = 100°$ (alt. $\angle$, $BE \parallel DA$) $\angle EBC = 25°$ (alt. $\angle$ to bearing of B from C) $\angle ABC = 75°$	
4aii	Calculate the bearing of C from D,	
	Draw a north line on point C. Label due south point as F. $\angle FCD = 278° - 180°$ $\quad\quad = 98°$ The bearing of C from D = 098°	
4aii	Calculate the length of AC.	
	Using cosine rule, $AC^2 = 90^2 + 78^2 - 2(90)(78)\cos 75°$ $AC = \sqrt{0550.18061}$ $AC = 102.714\,\text{m}$ $AC = 103\text{m}$ (3s.f)	
4bi	A drone hovers at a height of 70 m above D. A man of height 1.75m walks along path AC. He stopped at E to take a picture of the drone when the maximum angle of depression from the drone to the top of the man's head was 58°. Calculate the length of DE.	
	Vertical height of the drone from man = (70 – 1.75)m $\quad\quad\quad\quad\quad\quad\quad\quad = 68.25$m $\tan 58° = \dfrac{68.25}{DE}$ $DE = 42.647\,\text{m}$ $DE = 42.6\,\text{m}$ (3s.f) Note: If student didnt consider the height of the man in the calculation, zero mark.	
4bii	Calculate the area of the field $ABCD$.	
	Area of $ABCD = \dfrac{1}{2}(102.714)(42.647) + \dfrac{1}{2}(90)(78)\sin 75$ $\quad\quad\quad\quad = 5580.621\text{m}^2$ $\quad\quad\quad\quad = 5580\ \text{m}^2$ (3s.f)	
5	Adam runs a drink stall franchise in 4 locations. The number of cups for each type of drink sold a day is shown in the table below.	
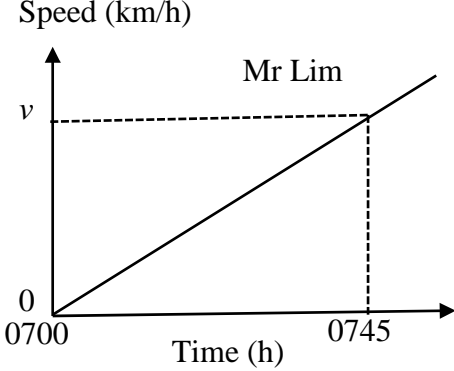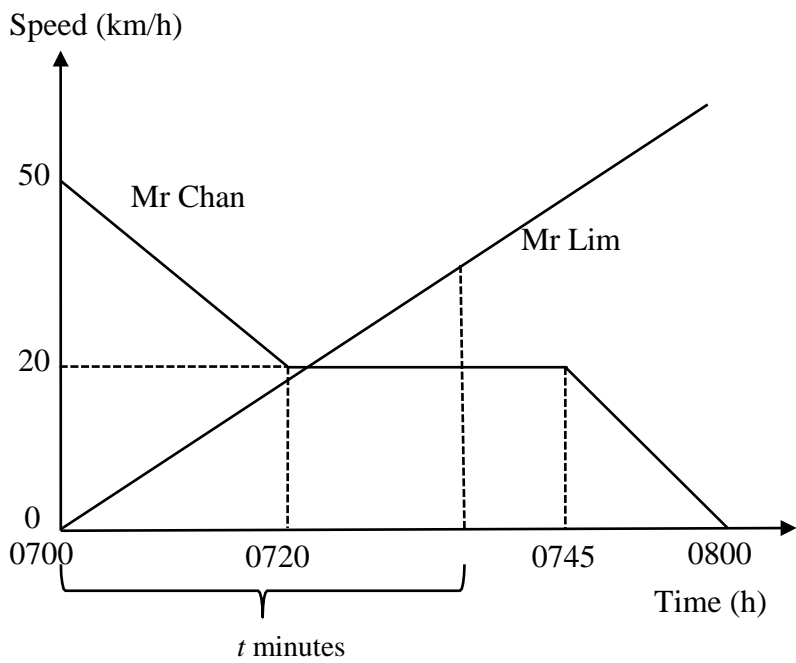
			Types of Drink		
			Coffee	Tea	Fruit Juice
	Location	Branch *A*	60	42	5
		Branch *B*	24	30	0
		Branch *C*	30	35	14
		Branch *D*	30	40	20

5a	Represent the above information as a 4×3 matrix **P**.	[1]

$$\mathbf{P} = \begin{pmatrix} 60 & 42 & 5 \\ 24 & 30 & 0 \\ 30 & 35 & 14 \\ 30 & 40 & 20 \end{pmatrix}$$

5b	The price of drinks are shown in the table below.	

Drink	Price (SGD$)
Coffee	1.50
Tea	1
Fruit Juice	2

Represent the above information as a 3×1 matrix **N**.

$$\mathbf{N} = \begin{pmatrix} 1.5 \\ 1 \\ 2 \end{pmatrix}$$

5c	Evaluate the matrix $\mathbf{T} = \mathbf{PN}$.	[1]

$$\mathbf{T} = \begin{pmatrix} 60 & 42 & 5 \\ 24 & 30 & 0 \\ 30 & 35 & 14 \\ 30 & 40 & 20 \end{pmatrix} \begin{pmatrix} 1.5 \\ 1 \\ 2 \end{pmatrix}$$

$$= \begin{pmatrix} 142 \\ 66 \\ 108 \\ 125 \end{pmatrix}$$

5d	State what each of the elements of matrix **T** represents.

The elements of matrix T represent the total amount of money collected from all the drinks from branch A, B, C and D respectively.

Or

The elements of matrix T represent the total amount of money collected from all the drinks from each branch respectively.

Or

The elements of matrix T represent the amount of money collected from all the drinks from branch A, B, C and D respectively.

Or

The elements of matrix T represent the amount of money collected from all the drinks from each branch respectively.

5ei	The cost of all the ingredients per day for Branch *A*, *B*, *C* and *D* is shown in the table below.	[2]

Branch	All ingredients for drinks	
	In USD	In SGD
A	*p*	27
B	12	16.20
C	16	21.60
D	23	*q*

Find the value of *p* and *q*.

$p = 20$
$q = 31.05$

5eii	The rental and operating cost per day for Branch *A*, *B*, *C* and *D* is shown in the table below.	[2]

Branch	Rental & Operating Cost (SGD)
A	40
B	45
C	50
D	60

Using matrix operations, calculate the total amount of profit in SGD Adam made that day.

$$\begin{pmatrix} 142 \\ 66 \\ 108 \\ 125 \end{pmatrix} - \begin{pmatrix} 40 \\ 45 \\ 50 \\ 60 \end{pmatrix} - \begin{pmatrix} 27 \\ 16.20 \\ 21.60 \\ 31.05 \end{pmatrix} = \begin{pmatrix} 75 \\ 4.8 \\ 36.4 \\ 33.95 \end{pmatrix}$$

$$(1\ 1\ 1\ 1) \begin{pmatrix} 75 \\ 4.8 \\ 36.4 \\ 33.95 \end{pmatrix} = (150.15)$$

The total amount of profit Adam made is $150.15.

6	44 boys ran the 2.4 km and their timings are shown in the table.						

t (minutes)	$8 \le t < 9$	$9 \le t < 10$	$10 \le t < 11$	$11 \le t < 12$	$12 \le t < 13$	$13 \le t < 14$
Frequency	1	h	12	11	k	6

6a	The estimated mean timing is 11.477 minutes. Estimate to the nearest integer the value of h and the value of k.	[4]

$$1 + h + 12 + 11 + k + 6 = 44$$
$$h + k = 14$$
$$\frac{1(8.5) + h(9.5) + 12(10.5) + 11(11.5) + k(12.5) + 6(13.5)}{44} = 11.477$$
$$9.5h + 12.5k = 162.988$$
$$9.5(14 - k) + 12.5k = 162.988$$
$$3k = 29.988$$
$$k = 9.996$$
$$= 10$$
So $h = 4$

6b	Estimate the standard deviation.	[1]

$$\text{Standard Deviation} = \sqrt{\frac{5867}{44} - (11.477)^2} = 1.2701 \text{ minutes}$$

6c	Explain why in this case, the mean is better than the median as a measure of central tendency.	[1]
	There are no outliers.	

6d	Another group of 35 boys ran the 2.4 km and their mean and standard deviation were 11.7 minutes and 2.10 minutes respectively. Comment on the timings of these two groups of boys.	[2]

The first group of boys is faster as their mean of 11.477 minutes is less than the mean of the second group with mean 11.7 minutes.

The timings for the first group is more consistent as their standard deviation of 1.27 minutes is less than that for the second group at 2.10 minutes.

7	It is given that point A lies on the y-axis while point B lies on the x-axis such that $OB = 2OA$, where O is the origin. given that the line AB passes through the point	[3]

	$\left(4, \dfrac{5}{2}\right)$, find the equation of the line *AB*.		
	Gradient of line $AB = -\dfrac{1}{2}$ Equation of line *AB* is in the form $y = mx + c$ and using the given point $(4, \dfrac{5}{2})$, $\dfrac{5}{2} = -\dfrac{1}{2}(4) + c$ $c = \dfrac{9}{2}$ $\therefore y_{AB} = -\dfrac{1}{2}x + \dfrac{9}{2}$		
8	In the diagram, line *AB* and line *CD* are tangents to point *A* and point *D* respectively on the circumference of the circle with centre *O*. Angle $DAE = 33°$, angle $ECD = 59°$ and *AEC* is a straight line. *E*, *F*, and *G* are points on the circumference of the circle. 		
8a	Find angle *EOD*.	[1]	
	Angle $EOD = 66°$ (angle at centre = 2 angle at circumference)		
8b	Find angle *EFD*		
	Angle $EFD = 33°$ (angle in same segment)		
8c	Find angle *EGD*		
	Angle $EGD = 147°$ (angle in opp segment)		
8d	A circle is drawn with the line *AC* as its diameter. Explain why point *D* will not lie on the circumference of the circle.	[2]	

	Angle $ADC = 180° – 59° – 33° = \underline{88°}$, and is <u>not 90°</u>, <u>angle in semicircle property does not apply</u> and hence A will not lie on the circumference of the circle.	
8e	Line AB and CD are extended and meet at T. Find the angle ATD.	
	Angle $ADC = 180° – 33° – 59° = 88°$ Angle ODA = angle $OAD = 90°– 88° = 2°$. (tan perpendicular to rad, base of isosceles triangle) Angle $BAD = 90° – 2° = 88°$ (tan perpendicular to rad) Angle $ATD = 180° – 88° – 88° = 4°$ (angle sum of triangle)	
9	Mr Chan driving a car at 50 km/h passes a lamppost A and stops at lamppost B, one hour later. When Mr Chan passes the lamppost A, Mr Lim, on a motorcycle, starts from A and overtakes Mr Chan. The motorcycle has uniform acceleration of 80 km/h^2. The speed-time graphs of Mr Chan and Mr Lim are shown in the diagram. Speed (km/h) 	
9ai	Find the speed of the car at 0715 h.	[2]
	$\dfrac{50 – s}{\left(\dfrac{15}{60}\right)} = \dfrac{30}{\left(\dfrac{20}{60}\right)}$ $s = \dfrac{55}{2} = 27\dfrac{1}{2}$ km/h 	

9ai i	Find the speed of the motorcycle at 0745 h.	[1]
	$$\frac{v-0}{\left(\frac{45}{60}\right)}=80$$ $$v=60 \ \text{km/h}$$	
9ai ii	Find the time, to the nearest minute, the motorcycle overtakes the car, given that it was between 0720 h and 0745 h	[4]
	Let t minutes be the time taken by Mr. Lim to overtake Mr. Chan Distance travelled by Mr Chan from 0700 to 0720 $$=\frac{1}{2}(50+20)\times\frac{20}{60}=\frac{35}{3}\ \text{km}$$ Distance travelled by Mr Chan from 0720 until overtaken $$=\left(\frac{t-20}{60}\right)\times 20=\frac{t-20}{3}\ \text{km}$$ Distance travelled by Mr Lim from 0700 until overtaking Mr Chan $$=\frac{1}{2}\times\frac{t}{60}\times\left(80\times\frac{t}{60}\right)=\frac{t^2}{90}\ \text{km}$$	
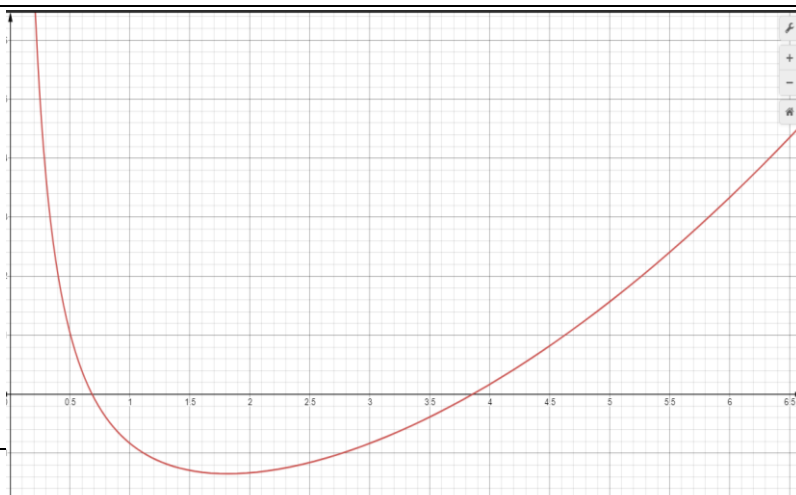
	At the overtaking time, Distance travelled by Mr Chan = Distance travelled by Mr Lim $$\frac{35}{3}+\frac{t-20}{3}=\frac{t^2}{90}$$ $$t^2=90\left(\frac{35}{3}+\frac{t-20}{3}\right)$$ $$=1050+30t-600$$ $$t^2-30t-450=0$$ $$t=\frac{-(-30)\pm\sqrt{(-30)^2-4(1)(-450)}}{2(1)}$$ $$=40.9808 \quad\text{or}\quad -10.9808(\text{NA})$$ The time is 0741 h.	
9b	Sketch the acceleration time graph for Mr. Chan.	[2]
	Acceleration from 0700 to 0720 $=\dfrac{50-20}{-\dfrac{20}{60}}=-90$ km/h^2 Acceleration from 0745 to 0800 $=\dfrac{20-0}{-\dfrac{15}{60}}=-40$ km/h^2 	
10	The diagram below shows a rectangle with breadth $(x+15)$ cm. The circle with centre at A has a radius of 10 cm. The semicircle with centre at B and the semicircle with centre C are congruent and each has a radius of x cm. The small circle with centre A touches the semicircles at point D and E. The line AO bisects the length of the rectangle and is a tangent to both of the semicircles. 	
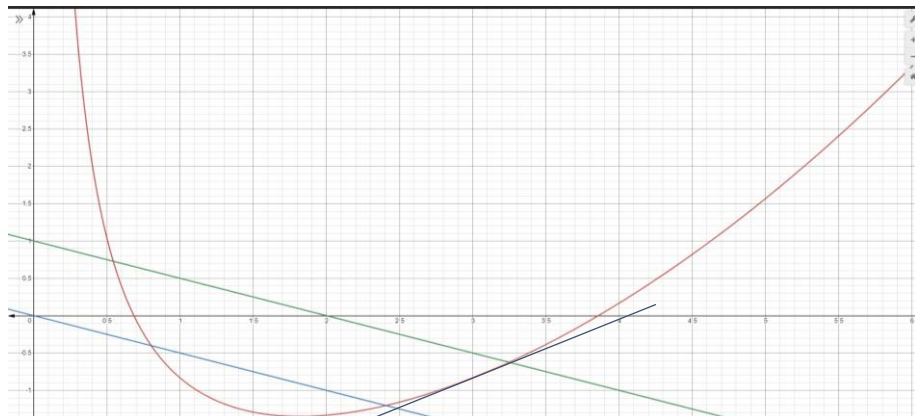
10a	Write down an expression, in terms of x, for the length AC.	[1]
	$AC = (x+10)$cm	
10b	Write down an expression, in terms of x, for the length OA.	[1]
	$OA = (x+15) - 10$ $OA = (x+5)$ cm	
10c	Hence, write down an equation and show that it simplifies to $\quad x^2 - 10x - 75 = 0$.	[3]
	$AC^2 = OA^2 + OC^2$ $(x+10)^2 = (x+5)^2 + x^2$ $x^2 + 20x + 100 = x^2 + 10x + 25 + x^2$ $-x^2 + 10x + 75 = 0$ $x^2 - 10x - 75 = 0$	
10d	Solve the equation $x^2 - 10x - 75 = 0$.	[2]
	$x^2 - 10x - 75 = 0$ $(x-15)(x+5) = 0$ $x = 15$ or $x = -5$	
10e	Hence, find the shaded area.	[2]
	Shaded area $= \pi R^2 + \pi r^2 = \pi(15^2 + 10^2)$ ≈ 1021.01 ≈ 1020 cm^2	
11	A couple intends to purchase a HDB flat and they intend to take a loan from a financial institution. The formula to calculate the monthly mortgage payment is given by	

$$M = \dfrac{P\left(\dfrac{i}{100}\left(1+\dfrac{i}{100}\right)^{n}\right)}{\left(\left(1+\dfrac{i}{100}\right)^{n}-1\right)}$$

Where M is the monthly mortgage payment, P is the principal loan amount, i is the monthly interest rate, and n is the number of months required to repay the loan.
(Source: https://www.businessinsider.com/personal-finance/how-to-calculate-mortgage-payment#:~:text=If%20you%20want%20to%20do,0.04%2F12%20%3D%200.0033)

11 a	If the couple takes a \$100000 loan to be repaid in 10 years, find the total interest paid as a percentage of the loan, assuming an interest rate of 2% per annum.	[3]

$$P = 100000 \qquad i = \dfrac{2}{12} = \dfrac{1}{6} \qquad n = 10 \times 12 = 120$$

$$M = \dfrac{P\left(\dfrac{i}{100}\left(1+\dfrac{i}{100}\right)^{n}\right)}{\left(\left(1+\dfrac{i}{100}\right)^{n}-1\right)}$$

$$= \dfrac{100000\left(\dfrac{1}{600}\left(1+\dfrac{1}{600}\right)^{120}\right)}{\left(\left(1+\dfrac{1}{600}\right)^{120}-1\right)}$$

$$= 920.1345 = \$920.13$$

11 b	The couple intends to take a loan from a financial institution. so they will need to pay 25% of the price as down payment. For the down-payment, they intend to pay up to \$50000. An online search yielded information in the tables below.	[3]

2021 Property Prices in Singapore

Type	HDB BTO Flats (Non-Mature Estates)	HDB BTO Flats (Mature Estates)	Resale Flats
Two-Room (Flexi)	\$90,000 to \$162,000	\$137,000 to \$277,000	–

Three-Room	$164,000 to $248,000	$205,000 to $421,000	$350,000 to $380,000
Four-Room	$253,000 to $381,000	$311,000 to $617,000	$420,000 to $550,000
Five-Room	$405,000 to $516,000	$423,000 to $725,000	$520,000 to $700,000

Source: https://www.singsaver.com.sg/blog/costs-of-bto-flat-resale-flat-ec-and-condo-in-singapore

(Source: https://www.hdb.gov.sg/residential/buying-a-flat/resale/getting-started/types-of-flats)

Determine all the types of flats that the couple can consider purchasing.

25% of the 2021 Property Prices in Singapore

Two-Room (Flexi)	$22,500 to $40,500	$34,250 to $69,250	–
Three-Room	$41,000 to $62,000	$51,250 to $105,250	Past the $50000 limit
Four-Room	Past the $50000 limit	Past the $50000 limit	Past the $50000 limit

From the table, the following flats are within the couple's means:
1. HDB BTO Flats (Non-Mature Estates) Two-Room (Flexi),
2. Some HDB BTO Flats (Mature Estates) Two-Room (Flexi) in the lower price range
3. Some HDB BTO Flats (Non-Mature Estates) Three-Room in the lower price range.

	Alternatively, since 25% is $50000, the full price is budgeted at $200000. From the table, the following flats are within the couple's means: 1. HDB BTO Flats (Non-Mature Estates) Two-Room (Flexi), 2. Some HDB BTO Flats (Mature Estates) Two-Room (Flexi) in the lower price range 3. Some HDB BTO Flats (Non-Mature Estates) Three-Room in the lower price range.	
11c	Based on the information given in the tables only, give the type of flat that gives the best value for the money spent. State one assumption that the couple could have made.	[3]
	Since there is a range of prices, use the midpoint for each range to calculate price per sq m. 1. HDB BTO Flats (Non-Mature Estates) Two-Room (Flexi), Midpoint = $126000, For 36 sq m, price per sq m is $126000 / 36 = $3500 For 45 sq m, price per sq m is $126000 / 45 = $2800 2. HDB BTO Flats (Mature Estates) Two-Room (Flexi) Midpoint = $207000, For 36 sq m, price per sq m is $207000 / 36 = $5750 For 45 sq m, price per sq m is $207000 / 45 = $4600 3. HDB BTO Flats (Non-Mature Estates) Three-Room in the lower price range Midpoint = $206000. Midpoint = 62.5 sq m Price per sq m is $206000 / 62.5 = $3296 Based on the price per sq m criterion, the first choice is a HDB BT Flats (Non-Mature Estates) Two-Room (Flexi) 45 sq m.	.
	OR	
	4. HDB BTO Flats (Non-Mature Estates) Two-Room (Flexi), For 36 sq m, price per sq m is $2500 to $4500 For 45 sq m, price per sq m is $2000 to $$3600 5. Some HDB BTO Flats (Mature Estates) Two-Room (Flexi) in the lower price range For 36 sq m, price per sq m is $3805.56 to $7694.44 For 45 sq m, price per sq m is $3044.44 to $6155.56 6. Some HDB BTO Flats (Non-Mature Estates) Three-Room in the lower price range For 60 sq m, price per sq m is $2733.33 to $4133.33 For 65 sq m, price per sq m is $2523.08 to $3815.38	

	Based on the price per sq m criterion, the first choice is a HDB BT Flats (Non-Mature Estates) Two-Room (Flexi) 45 sq m in the lowe price range.	
	Assumption, only one is needed: 1. The prices of the different types of housing remains stable regardless of region. 2. All the different types of flats are available. 3. Without detailed information, the couple assumes that for each floor area, there can be the full range of prices, e.g. for a 45 m^2 flat, the prices can range from \$90,000 to \$162,000. 4. Without detailed information, either the range of minimum to maximum, or the midpoint can be used for calculation. In each category, the lowest price corresponds to the smallest floor area, and the higher price corresponds to the larger floor area.	
12	The variables of x and y are connected by the equation $$y = \frac{x^2}{6} + \frac{2}{x} - 3.$$ Some corresponding values of x and y, correct to two decimal places, are given in the table below. 	x	0.5	1	1.5	2	2.5	3
---	---	---	---	---	---	---
y	p	−0.83	−1.29	−1.33	−1.16	−0.83		
12 a	Find the value of p.	[1]
	Sub x = 0.5 and y = p into $y = \frac{x^2}{6} + \frac{2}{x} - 3$ $p = \frac{0.5^2}{6} + \frac{2}{0.5} - 3 \approx 1.04$	
12 b	Use a scale of 2 cm to represent 1 unit, draw a horizontal x-axis from $0 \le x \le 6$. Use a scale of 4 cm to represent 1 unit, draw a vertical y-axis from $-2 \le y \le 4$. On your axes, plot the points given in the table and join them with a smooth curve.	[3]

12c	Use your graph to find the solutions of $\dfrac{x^2}{6} + \dfrac{2}{x} - 2 = 0$.	[2]
	$\dfrac{x^2}{6} + \dfrac{2}{x} - 2 = 0$ $\dfrac{x^2}{6} + \dfrac{2}{x} - 2 - 1 = 0 - 1$ $\dfrac{x^2}{6} + \dfrac{2}{x} - 3 = -1$ $y = -1$ From the graph, when $y = -1$, $x \approx 1.116 (\pm 0.2)$ or $x \approx 2.769 (\pm 0.2)$	
12 d	By drawing a tangent, find the gradient of the curve at $(3, -0.83)$.	[2]
	Draw a tangent at $(3, -0.83)$ Therefore gradient $\approx 0.878 \pm 0.2$	
12e i	On the same axes, draw the line of with gradient -0.5 that passes through the point with coordinates $(4, -1)$.	[1]

x	0	1	3
$y = -0.5$	0	-0.5	-1

B1 for two parallel lines (one is $y = -0.5x$ and the other is parallel to $y = -0.5x$ and pass through $(4, -1)$))

12e ii	Write down the equation of this line.	[1]
	From the graph, $y = -0.5x + 1$	
12e iii	Write down the x-coordinates of the points where the line intersects the curve.	[2]
	$x \approx 0.544(\pm 0.2)$ or $x \approx 3.29(\pm 0.2)$	
12e iv	These values of x are the solutions of the equation $x^3 + Ax^2 - 24x + B = 0$. Find the value of A and of B.	[2]

The values of x are the solutions for the pair of simultaneous equations

$$y = \frac{x^2}{6} + \frac{2}{x} - 3 \quad \text{and} \quad y = -0.5x + 1$$

$$\frac{x^2}{6} + \frac{2}{x} - 3 = -0.5x + 1$$

$$x^3 + 12 - 18x = -3x^2 + 6x$$

$$x^3 + 12 - 18x + 3x^2 - 6x = 0$$

$$x^3 + 3x^2 - 24x + 12 = 0$$

Therefore $A = 3$ and $B = 12$

$\frac{2}{x} - 3$