Answer **all** the questions.

1 **(a)** Evaluate $\dfrac{\sqrt{239}-17^2}{34.79^3 \times 13}$, giving your answer correct to 5 significant figures.

Answer _____ [1]

(b) Simplify $5x-2(x+2)$.

Answer _____ [1]

---

2 An estimated number of 36 000 people were present at a concert.

(a) If the estimated number was actually rounded off to 3 significant figures, state the maximum possible number of people at the concert.

Answer _____ [1]

(b) If the estimated number was actually rounded off to 2 significant figures, state the minimum possible number of people at the concert.

Answer _____ [1]

---

3 Factorise completely $6ax-2bx+9ay-3by$.

Answer _____ [2]

---

4 The equation of a curve is $y = x^2 + bx + c$ where b and c are constants.

(a) Given that (2 , 0) is a point on the curve, show that $b = -\frac{4+c}{2}$.

Answer

[2]

(b) If the y-intercept of the curve is 14, find the values of b and c.

Answer $b =$ _____ $c =$ _____ [2]

---

5 Triangle ABC is a right angled triangle. Given that $AB = 13$ cm and $BC = 12$ cm, find two possible lengths for the side AC.

Answer _____ or _____ cm [3]

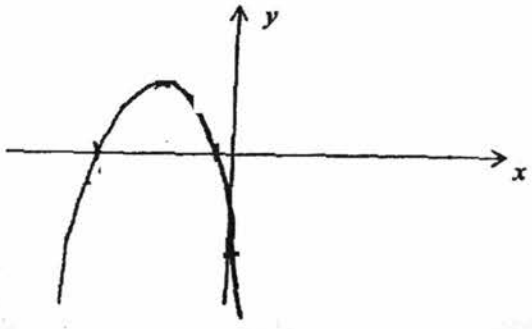
---

6 (a) Express $-x^2 - 5x - 6$ in the form $-(x + a)(x + b)$, where a and b are constants.

Answer _____ [1]

(b) Hence sketch the curve of $y = -x^2 - 5x - 6$, indicating clearly the intercepts and turning point.

Answer



[3]

---

7 Write as a single fraction in its simplest form $\frac{3x}{(x-2)^2} - \frac{2}{2-x}$.

Answer _____ [2]

---

8 The number of apples, oranges and pears at a fruit stall is given by the ratio 2 : 3 : 7.

(a) If there are 126 pears at the fruit stall, find the number of apples at the fruit stall.

Answer _____ [1]

(b) If half the number of oranges at the fruit stall is replaced by papayas, find the fraction of papayas at the fruit stall.

Answer _____ [1]

---

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

x	3	4	6	12
y	8	6	4	2

State whether x and y could be in direct or inverse proportion, and explain why this is so.

Answer _____

_____

_____ [2]

10 Solve the following equations.

(a) $5(x - 4) = 4 - 2(3x + 1)$

Answer $x =$ _____ [2]

(b) $\frac{3x+1}{5} = \frac{1}{x-2} - 1$

Answer $x =$ _____ [3]

11 Factorise the following.

(a) $25x - 30x^2$

Answer _____ [1]

(b) $5x^2 + 13x - 6$

Answer _____ [2]

(c) $12x^2 - 3$

Answer _____ [2]

---

12 A bag costs \$3500 in Singapore.
On a trip to the US, Amy manages to find an identical bag that costs US\$3000.

1 US dollar = 1.36 Singapore dollars.

Is the bag cheaper in the US or Singapore? You must show your calculations.

Answer _____ [2]

13 The length of a road from one end to the other is 34.1 km.

(a) On a map, the same road measures 5.5 cm. Write down the scale of the map in the form $1 : n$.

Answer 1 : _____ [2]

(b) A plot of land of area 88.412 km^2 has been marked out for construction of commercial buildings. What is the area on the map that is marked out for construction of commercial buildings?

Answer _____ cm^2 [3]

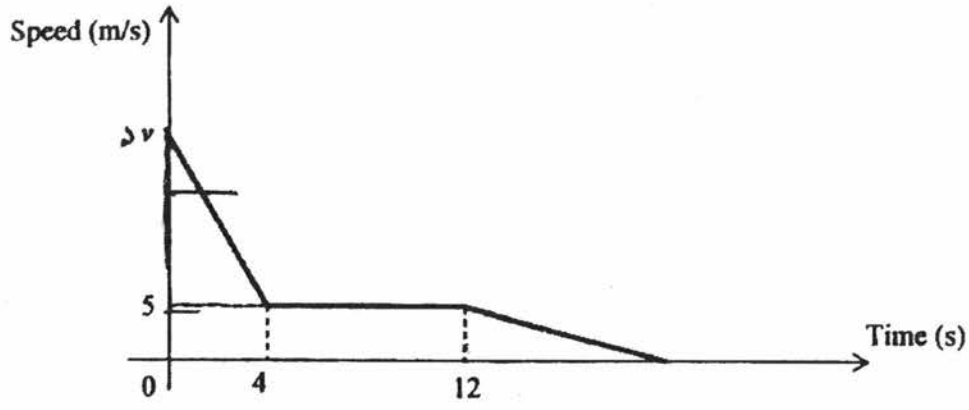
---

14 A computer costs $2300.
During a sale, David buys the computer for $1782.50.
Calculate the percentage discount of the computer during the sale.

Answer _____ % [2]

---

15 A car travelling at an initial speed of v m/s decelerates uniformly for 4 seconds, then travels at a uniform speed of 5 m/s for 8 seconds before decelerating uniformly until it comes to a complete rest. The speed-time graph for the car is shown below.



(a) A van, starting at the same time as the car from the same initial point travels along the same route at a uniform speed of 11 m/s throughout the journey. On the graph above, draw the line representing the speed-time graph of the van, given that $v > 11$. [1]

(b) It is given that deceleration is represented by the gradient of the speed-time graph. The deceleration of the car during the first 4 seconds is 3.75 m/s^2. Show that $v = 20$.

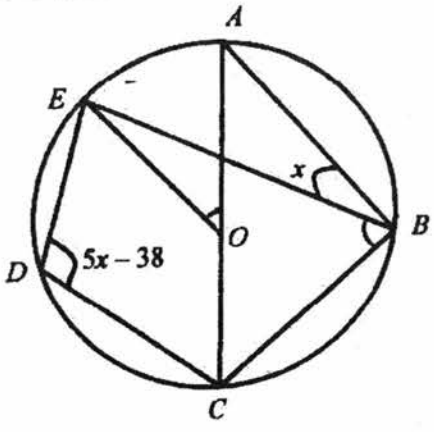
Answer

[2]

(c) It is given that the area under the speed-time graph represents the distance travelled. At how many seconds, after the van and car started from the initial point, will the van overtake the car?

Answer _____ s [4]

16



O is the centre of the circle passing through A, B, C, D and E.
Angle $ABE = x°$, and angle $EDC = (5x - 38)°$.

(a) Find, in terms of x, angle AOE.

Answer _____ ° [1]

(b) Find, in terms of x, angle EBC.

Answer _____ ° [1]

(c) Find x.

Answer $x =$ _____ [2]

17 David's wages, W, varies directly as the square of the number of sales he makes in a month. In January, he makes x number of sales. In February, the number of sales he makes increases by 150% as compared to January. *Calculate the percentage change in David's wages in February as compared to January.*

Answer _____ % [3]

---

18 A class of 40 students had their individual weights taken and the mean and standard deviation of the weights were calculated. It was later found out that the weighing machine used was faulty and every student should be heavier by 2 kg. Describe the effect, if any, it would have on the mean and standard deviation that was calculated.

Answer _____

_____

_____ [2]

---

19 (a) Express 600 as a product of its prime factors, giving your answer in index notation.

Answer _____ [2]

(b) p and q are not prime numbers.

Given that $600 \times pq$ is a perfect square, and that p and q are positive integers smaller than 10, find the smallest possible value of $p - q$.

Answer _____ [2]

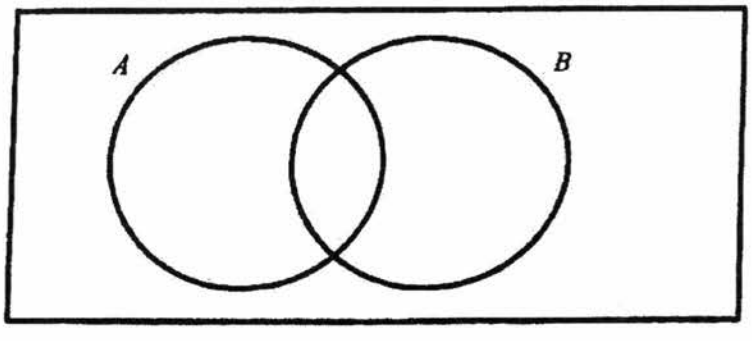
---

20 It is given that

$\xi = \{x : x \text{ is a positive integer smaller than } 10\}$,
$A = \{x : x \text{ is a prime number}\}$,
$B = \{x : x \text{ is an even number}\}$.

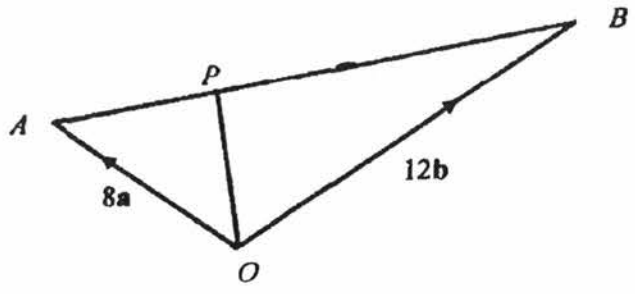
Write down all the numbers in the universal set in the Venn Diagram below.

Answer



[3]

21



OAB is a triangle.
$\overrightarrow{OA} = 8\mathbf{a}$ and $\overrightarrow{OB} = 12\mathbf{b}$.
P is a point on AB such that $AP : PB = 1 : 3$.

(a) Write each of the following in terms of **a** and **b**.
Give your answers in their simplest form.

(i) $\overrightarrow{AB}$.

Answer _____ [1]

(ii) $\overrightarrow{AP}$.

swer _____ [1]

(b) A line is drawn from O to Q where Q lies on the line AB extended. Given that B is the mid-point of PQ, express $\overrightarrow{OQ}$ in terms of **a** and **b**, giving your answer in its simplest form.

Answer _____ [2]

(c) Find the value of $\frac{\text{Area of triangle } OBQ}{\text{Area of triangle } OAQ}$.

Answer _____ [2]

22 The coordinates of A is $(-3, 5)$ and the coordinates of B is $(7, 10)$.
$\overrightarrow{AC} = \begin{pmatrix} 4 \\ -7 \end{pmatrix}$.

(a) Find $\overrightarrow{AB}$, expressing your answer as a column matrix.

Answer _____ [1]

(b) Find $\left|\overrightarrow{AC}\right|$.

Answer _____ [1]

(c) Find the coordinates of C.

Answer _____ [2]

23 An architect designing a walkway draws a scale drawing of the walkway below. The drawing is drawn accurately to a scale of 1 : 10 000.
Point B is directly east of Point A.

Answer

A ——————————— B

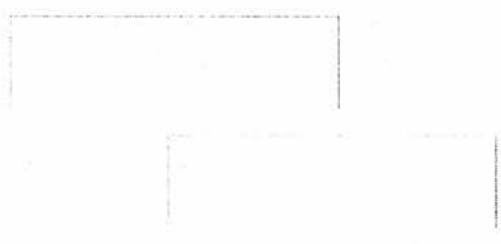
(a) The architect plans to extend the walkway by 0.8 km at a bearing of 145° from point B. Use the scale drawing above to draw the extension of the walkway and label the end of the walkway as Point C. [2]

(b) The walkway is then further extended from Point C back to Point A. By measurement, find the length of the walkway from A to C in kilometres.

Answer _____ km [1]

(c) The architect intends to put a notice board along BC, equidistant from points A and C. By constructing a perpendicular bisector on the scale drawing, indicate and label the position of the notice board with the letter N. [2]

F PAPER



Answer **all** the questions.

1 **(a)** Express as a single fraction in its simplest form

$$\frac{1}{p-2}-\frac{2}{4p+3}.$$ [3]

(b) The formula used in an experiment is

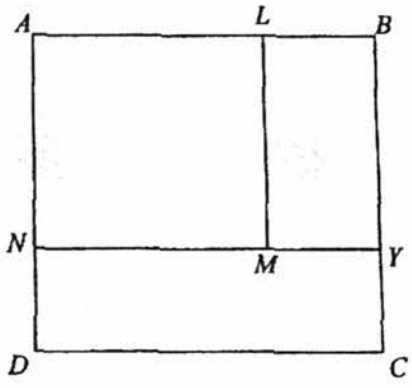
$$T=\frac{k(x-a)}{a}.$$

(i) Express x in terms of T, k and a. [2]

(ii) Find, in terms of k, the value of T when $x = 3a$. [1]

---

2 In the given diagram, $ABCD$ and $ALMN$ are squares.
$AB = (3x - 1)$ cm and $AN = (x + 2)$ cm.



(a) Write down the length of LB in terms of x. [1]

(b) The area of the rectangle $LBYM$ is 10 cm^2.
Write down an equation in x and show that it reduces to $2x^2 + x - 16 = 0$. [2]

(c) Solve the equation $2x^2 + x - 16 = 0$, giving your solutions correct to two decimal places. [4]

(d) Which value of x do you have to reject and why? [2]

(e) Hence, calculate the perimeter of $LBYM$, giving your answer to the nearest millimetre. [2]

---

3 Singapore and Kuala Lumpur are 350.7 km apart.

(a) Ms Wong travelled by car from Singapore to Kuala Lumpur (KL) at an average speed of 90 km/h. How long did the journey take? [1]

(b) Ms Wong left Singapore at 0600. If she had a meeting to attend in KL at 1000, was she early or late for this meeting? [1]

(c) After the 3-hour meeting, Ms Wong took a one-hour lunch-break before making her return journey. She wanted to reach Singapore before the evening peak-hour commenced at 4pm. If the speed limit is 100 km/h, would she be able to reach Singapore by 4pm? [3]

(d) The upcoming Singapore-KL high-speed-rail (HSR) train line boasts a travelling time of 99 minutes in a single direction between the two cities. What is the average speed of the train? [1]

(e) The maximum speed of the train is expected to be 300 km/h. What is the percentage decrease in speed as mentioned in (d), compared to the expected speed? [2]

---

4 A bag contains 6 tennis-balls comprising of 4 green balls and 2 red balls.

Amy selects a ball at random from the bag and then replaced. She randomly selects another ball from the same bag.

(a) Draw a probability-tree diagram to represent the outcomes. [1]

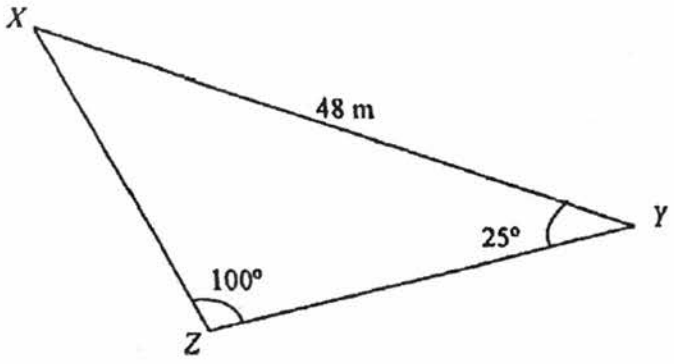
(b) Find, in its simplest form, the probability that the selected balls

(i) are green, [1]

(ii) are of different colours, [2]

(iii) include at least one red ball. [2]

5



X, Y and Z are on level horizontal ground. The bearing of Y from X is 100°.
$XY = 48$ m, angle $XZY = 100°$ and angle $XYZ = 25°$.

(a) Calculate

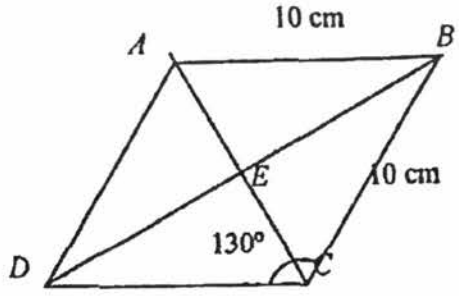
(i) the bearing of X from Y, [1]

(ii) the bearing of Z from X, [2]

(iii) the shortest distance from Z to XY. [3]

(b) If there is a tower of height 10 m at X, calculate the angle of depression of Y from the top of the tower. [2]

6



The diagram shows a cross-section of a rhombus cookie-box, $ABCD$, and E is the intersection-point of AC and BD.
AB // DC and AD // BC, $AB = CD = 10$ cm and angle $BCD = 130°$.

(a) **(i)** Explain why angle AEB is a right-angle. [1]

(ii) Calculate BD. [2]

(iii) Calculate the length of EC. [1]

(iv) Hence, calculate the area of triangle BCD. [1]

(b) A geometrically similar smaller version of the cookie-box is necessary for smaller quantities of cookies. In the smaller cookie-box, $AB = 8$ cm.

Find the cross-sectional area of the smaller cookie-box. [2]

7 (a) The following table shows the scores of 30 students from Secondary 4 Ace in their Mathematics Examination.

80	88	96	60	59	70	88	97	69	60
39	37	69	74	47	92	72	49	58	66
88	82	100	95	56	77	99	62	79	63

(i) Calculate the mean score for the students in Secondary 4 Ace. [1]

(ii) Calculate the standard deviation for the scores above. [1]

(b) The mean and standard deviation of Secondary 4 Bravo for the same examination are as follow:-

Mean Score	71.75
Standard Deviation	15.6

(i) Which class performed better? Support your claim with evidence. [2]

(ii) Which class had more consistent results? Support your claim with evidence. [2]

8 A funnel is in the form of an inverted right circular cone. Figure 1 shows a vertical cross-section of the funnel. It contains oil and water (which do not mix). The depths of water and oil are all 10 cm, with water at the bottom. It is given that the height of the funnel is 30 cm and the base radius is 9 cm.

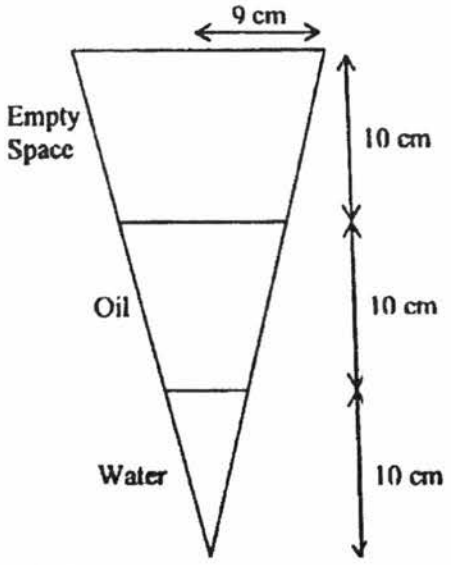


Figure 1

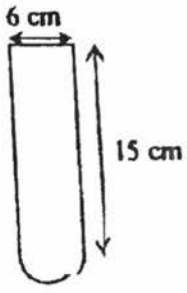


Figure 2

(a) Find the volume of the funnel in terms of π. [1]

(b) Find the fraction of

(i) $\dfrac{\textit{volume of oil}}{\textit{volume of water}}$, [2]

(ii) $\dfrac{\textit{surface area of the funnel in contact with water}}{\textit{total surface area of the interior of the funnel}}$. [2]

(c) All the water in the funnel is then drained through the tap at the vertex of the funnel, into another container formed by a cylinder of diameter 6 cm and surmounted by a hemisphere at the lower part of the cylinder, as shown in Figure 2. The height of the cylindrical part of the container is 15 cm.
Find the depth of water in this container.
(Note: Only the water is drained; the oil remains in the funnel.) [3]

9 Two outlets of a new fast-food chain sell three types of soft drinks, namely Coke, Sprite and Lemon Tea. The tables below show the sales of the soft drinks in the afternoon and evening respectively.

	Afternoon		
	Coke	Sprite	Lemon Tea
Outlet *A*	280	200	150
Outlet *B*	200	300	350

	Evening		
	Coke	Sprite	Lemon Tea
Outlet *A*	420	300	260
Outlet *B*	350	420	540

The sales of the soft drinks in the afternoon are represented by the matrix **A**, where

$$\mathbf{A} = \begin{pmatrix} 280 & 200 & 150 \\ 200 & 300 & 350 \end{pmatrix}.$$

(a) Write down the 2×3 matrix **E** representing the sales in the evening for the two outlets respectively. [1]

The cost price of supplying the soft drinks to the fast-food chain is \$1.20, \$1.00 and \$1.50 for Coke, Sprite and Lemon Tea respectively. The selling price for each soft drink is \$2.00, \$2.00 and \$3.50.
The cost price of supplying the soft drinks is represented by matrix **C**, where

$$\mathbf{C} = \begin{pmatrix} 1.20 \\ 1.00 \\ 1.50 \end{pmatrix}.$$

(b) Write down the column matrix **S** representing the selling price of the soft drinks for the three types of soft drinks respectively. [1]

(c) Calculate $\mathbf{T} = \mathbf{A} + \mathbf{E}$, and describe what matrix **T** represents. [2]

(d) Evaluate **AC** and describe what is represented by the elements of **AC**. [2]

(e) Evaluate **T** (**S** – **C**), and explain what the elements of **T** (**S** – **C**) represent. [2]

(f) (i) If the fast-food chain's general manager would like to evaluate the combined total amount in sales for both outlets for the day, write down the matrix operation he needs to calculate. [1]

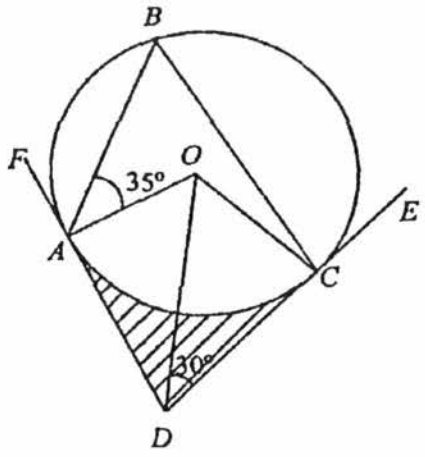
(ii) Evaluate the matrix that you have specified in part (i) above. [1]

10 (a) (i) Find the value of each interior angle of a regular 15-sided polygon. [2]

(ii) An n-sided polygon has 3 interior angles measuring 140° each.
The remaining interior angles all measure $y°$ each.

Find an expression for y in terms of n. [2]

(b)



The diagram shows a circle ABC, with centre O.
FAD and DCE are tangents to the circle, and $OA = OC = 8$ cm.
Angle $OAB = 35°$ and angle $CDO = 30°$.

(i) Name the pair of congruent triangles. [1]

(ii) Find

(a) angle DOA, [1]

(b) angle CBA, [1]

(c) angle ECB. [1]

(d) the area of the shaded region. [2]

11 Answer the whole of this question on a sheet of graph paper.

From the top of a mountain, Barry fires a pellet from an air gun upwards into the air. The height, h metres, of the pellet from Barry t seconds after it is released can be modelled by the equation $h = 1 + 10t - 3t^2$.

Some corresponding values of t and h are given in the table below.

t	0	1	2	3	4	5	6
h	1	8	9	4	m	-24	-47

(a) Calculate the value of m. [1]

(b) Using a scale of 2 cm to represent 1 second, draw a horizontal t-axis for $0 \le t \le 6$.
Using a scale of 1 cm to represent 5 metres, draw a vertical h-axis for $-50 \le h \le 10$.

On your axes, plot the points given in the table and join them with a smooth curve. [3]

(c) Use your graph to estimate

(i) the maximum height of the pellet above ground level, [1]

(ii) the length of time that the pellet was more than 2 metres above ground level, [2]

(iii) the time elapsed before the pellet reaches the same level as it was fired from. [1]

(d) By drawing a tangent, find the gradient of the curve at $(5, -24)$. [3]
State the units of your answer.

12 From July 2017 onwards, the price of water to households will be increased in two steps, on 1 July 2017 and on 1 July 2018. At the same time, the Government will be increasing the annual GST Voucher – U-Save rebate for eligible HDB households by between $40 and $120, depending on the flat type. The average change in water bill after the increased U-Save rebates is given in Table A on the next page.

(a) Show that for a 4-room HDB flat, the U-Save Rebate given in July 2017 is $7. [1]

Table B shows how the water tariffs will be increased between 2017 and 2018.
Charlie owns a new 4-room build-to-order (BTO) HDB flat in Woodleigh.
Read and understand the contents of the utility bill dated June 2017 in Table C.

(b) Assuming that the amount of water Charlie used in July 2017 is the same as that for June 2017, calculate the individual charges in July 2017 for

(i) water usage (reading), [1]
(ii) waterborne fee, [1]
(iii) water conservation tax, [1]
(iv) total cost of water services (after deduction of U-Save Rebate). [1]

(c) Assuming that the amount of water Charlie uses for July 2018 is the same as that for June 2017, calculate the total cost of water services in July 2018 (before the U-Save Rebate). [3]

(d) Why do you think that average changes in 2017 and 2018 bills are increasing from 1-room HDB flats to the executive/multi-generation flats? [1]

Table A: Average Change in Water Bill after Increased U-Save Rebates (by HDB Flat Type)

Source: https://www.pub.gov.sg/Documents/WaterPriceRevisionsBrochure.pdf

Water Bill	1-room HDB flat	2-room HDB flat	3-room HDB flat	4-room HDB flat	5-room HDB flat	Executive / Multi-Generation HDB flat
Before price increase	$23	$29	$33	$42	$44	$49
After price increase (2017)	$26	$34	$37	$47	$50	$55
After increased U-Save rebates (2017)	$16	$24	$29	$40	$45	$51
Average change in 2017 Bill	– $7	– $5	– $4	– $2	+ $1	+ $2
Average change in 2018 Bill	– $3	$0	+ $2	+ $5	+ $8	+ $11

Table B: Water Price Revisions

Source: https://www.pub.gov.sg/Documents/WaterPriceRevisionsBrochure.pdf

		Before 1 July 2017		From 1 July 2017		From 1 July 2018	
		Water Price ($/m³)		Water Price ($/m³)		Water Price ($/m³)	
		0 – 40m³	> 40m³	0 – 40m³	> 40m³	0 – 40m³	> 40m³
Potable Water	Tariff	$1.17	$1.40	$1.19	$1.46	$1.21	$1.52
	Water Conservation Tax (% of water tariff)	$0.35 (30% of $1.17)	$0.63 (45% of $1.40)	$0.42 (35% of $1.19)	$0.73 (50% of $1.46)	$0.61 (50% of $1.21)	$0.99 (65% of $1.52)
Used Water	Waterborne Fee	$0.28	$0.28	$0.78	$1.02	$0.92	$1.18
	Sanitary Appliance Fee	$2.80 per fitting*		Combined into Waterborne Fee		Combined into Waterborne Fee	
Total Price		$2.10	$2.61	$2.39	$3.21	$2.74	$3.69

Note: Water is charged per cubic metre (m^3), which is equivalent to 1000 litres.
All figures are before GST.
*For the calculation of total price, the Sanitary Appliance Fee is converted to its volumetric equivalent.

Table C: Utility Bill for June 2017

June 2017 Bill
Account No. ########

Breakdown of Current Charges	Usage	Rate ($)	Amount ($)	Total ($)
Electricity Services				
Reading taken on 28 Jun 2017: 53902	736 kWh	0.2139	157.43	157.43
Water Services by Public Utilities Board				
Reading taken on 28 Jun 2017 : 5094.9	35.8 Cu M	1.1700	41.89	
Waterborne Fee	35.8 Cu M	0.2803	10.03	
Water Conservation Tax	$41.89	30%	12.57	
Sanitary Appliance Fee	2 Fittings	2.8032	5.61	70.10
Refuse Removal by Veolia ES Singapore P L	1 Qty	7.71	7.71	7.71
Subtotal			235.24	235.24
GST	$235.24	7%	16.46	16.46
Current Charges: (Inclusive of GST)				$251.70

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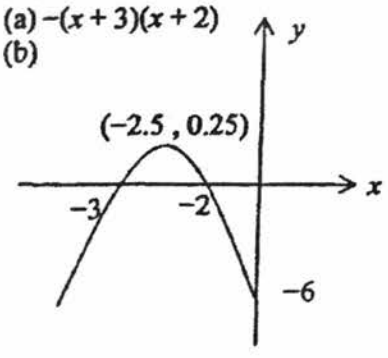
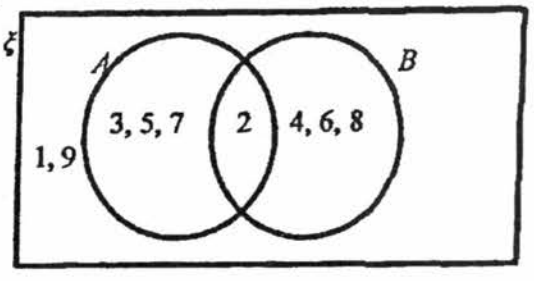
Answer Key

1. (a) −0.00 049 971
   (b) $3x-4$
2. (a) 36 049
   (b) 35 500
3. $(2x+3y)(3a-b)$
4. (a) $b=-\dfrac{4+c}{2}$
   (b) b = −9 ; c = 14
5. $AC = 5$ cm or 17.7 cm
6. (a) $-(x+3)(x+2)$
   (b)



7. $\dfrac{5x-4}{(x-2)^2}$
8. (a) 36
   (b) $\dfrac{1}{8}$
9. –
10. (a) $x=2$
    (b) $x=\dfrac{1}{3}$ or $x=3$
11. (a) $5x(5-6x)$
    (b) $(5x-2)(x+3)$
    (c) $3(2x+1)(2x-1)$
12. cheaper in Singapore
13. (a) 620000
    (b) 2.3 cm^2
14. 22.5%
15. (a) -
    (b) –
    (c) $t=5$
16. (a) $2x$
    (b) $90-x$ or $218-5x$
    (c) $x=32$
17. 525%
18. –
19. (a) $600 = 2^3 \times 3 \times 5^2$
    (b) −5
20.



21. (ai) 12b − 8a
    (aii) 3b − 2a
    (b) 21b − 6a
    (c) $\dfrac{3}{7}$
22. (a) $\begin{pmatrix}10\\5\end{pmatrix}$
    (b) 8.06
    (c) (1 , −2)
23. (b) 1.16 km

Answer Key

1. (a) $\frac{2p+7}{(p-2)(4p+3)}$

   (bi) $x=\frac{aT}{k}+a$

   (bii) $T=2k$

2. (a) $(2x-3)$ cm

   (b) –

   (c) $x=2.59$ or -3.09

   (d) –

   (e) 13.5 cm

3. (a) 3.90 h

   (b) She was early for the meeting.

   (c) She would not be able to reach Singapore by 4 pm.

   (d) $212.\dot{5}\dot{4}$ *km / h or* 213 *km / h* (*to* 3 *s.f.*)

   (e) $29.\dot{1}\dot{5}\%$ *or* 29.2% (*to* 3 *s.f.*)

4. (a) –

   (bi) $\frac{4}{9}$

   (bii) $\frac{4}{9}$

   (biii) $\frac{5}{9}$

5. (ai) 280°

   (aii) 165°

   (aiii) 16.9 m

   (b) 11.8°

6. (ai) –

   (aii) 18.1 cm

   (aiii) 4.23 cm

   (aiv) 38.3 cm^2

   (b) 49.0 cm^2

7. (ai) $72.3\dot{6}$ *or* 72.4 (*to* 3 *s.f.*)

   (aii) 17.6

   (bi) –

   (bii) –

8. (a) $810\pi\ cm^3$

   (bi) $\frac{7}{l}$ *or* 7

   (bii) $\frac{l}{9}$

   (c) 4.33 cm

9. (a) $E=\begin{pmatrix} 420 & 300 & 260 \\ 350 & 420 & 540 \end{pmatrix}$

(b) $S=\begin{pmatrix} 2.00 \\ 2.00 \\ 3.50 \end{pmatrix}$

(c) $T=\begin{pmatrix} 700 & 500 & 410 \\ 550 & 720 & 890 \end{pmatrix}$

Matrix T represents the sales of Coke, Sprite and Lemon Tea in the afternoon and evening at outlets A and B respectively.

(d) $AC=\begin{pmatrix} 761 \\ 1065 \end{pmatrix}$

Matrix AC represents the total cost price of supplying soft drinks to the fast-food chain in the afternoon at outlets A and B respectively.

(e) $T(S-C)=\begin{pmatrix} 1880 \\ 2940 \end{pmatrix}$

Matrix $T(S-C)$ represents the total profits in the afternoon and evening at outlets A and B respectively.

(fi) $\begin{pmatrix} 1 & 1 \end{pmatrix}\left[T\begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}\right]$

(fii) (3770)

10. (ai) 156°

(aii) $y=\dfrac{180n-780}{n-3}$ or $180-\dfrac{240}{n-3}$

(bi) –

(biia) 60°

(biib) 60°

(biic) 65°

(biid) 43.8 cm^2

11. (a) m = –7

(b) –

(ci) 9.4 m

(cii) 3.15s

(ciii) 3.35s

(d) -22.64 m/s

12. (a) $7

(bi) $42.60

(bii) $27.92

(biii) $14.91

(biv) $78.44

(c) $97.91

(d) -