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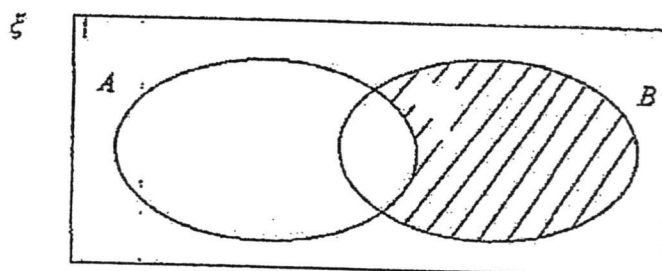
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Answer all the questions.

- 1 Express in set notation, the set shaded in the following Venn diagram.



Answer [1]

- 2 (a) Simplify $(3 + 2x)(1 + x)$.

Answer [1]

- (b) Factorise completely $32a^2 - 18b^2$.

Answer [2]

- 3 Factorise completely $12bx - 6ay + 8by - 9ax$.

Answer [2]

- 4 Write as a single fraction in its simplest form $\frac{5}{2+x} + \frac{6x}{x^2-4}$.

Answer [2]

- 5 Show that for all p , where p is a positive integer
 $(7p-3)^2 - 4p(p-3) + 6$ is divisible by 15.

Answer

[2]

- 6 (a) Express $5 - 6x - x^2$ in the form $p - (x + q)^2$.

Answer [2]

- (b) Hence, sketch the graph of $y = 5 - 6x - x^2$ indicating the y -intercept and the coordinates of the turning point on the graph.

Answer

[2]



- 7 A bicycle rental shop uses the formula $C = 5.5 + 3.5h$ to calculate charges for rental of bicycles, where C is the cost of rental and h is the number of hours of rental.

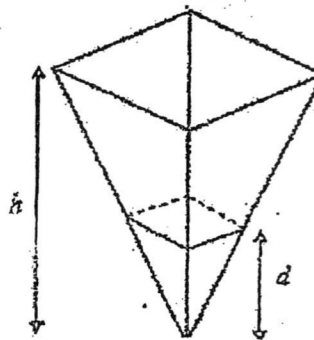
(a) State the basic charge to be paid regardless of the number of hours of rental.

Answer \$ [1]

- (b) Mathew and Ethan both rented a bicycle each for different number of hours. The difference in the cost of rental between the two of them is \$14. Find the difference in the number of hours of rental between the two boys.

Answer hours [2]

- 8 The diagram shows an inverted pyramid with a capacity of 800 cm^3 .

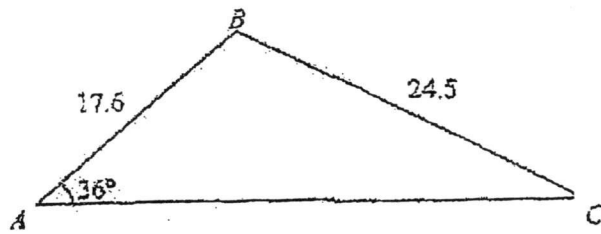


The depth of the liquid in the inverted pyramid, d , is one-third the height, h , of the pyramid. Calculate the volume of the liquid.

Answer cm^3 [2]



9



ABC is a triangle, where $AB = 17.6$ cm, $BC = 24.5$ cm and angle $BAC = 36^\circ$
Find angle ABC .

Answer angle $ABC = \dots\dots\dots [3]$

10 Jane plans to travel back to Singapore from the United States

In Singapore, the exchange rate is SGD \$1 = USD \$0.71.

In the United States, the exchange rate is USD \$100 = SGD \$153.

Jane wants to change USD \$1426 into Singapore dollars.

Which country should Jane change her money in order to get a better deal?

You must show your calculations.

Answer $\dots\dots\dots [3]$

- 11 Hector was arranging 315 one-centimetre cubes into a cuboid.
The perimeter of the base of the cuboid is 28 cm.
Each side of the cuboid has a length greater than 3 cm.
Find the height of the cuboid.

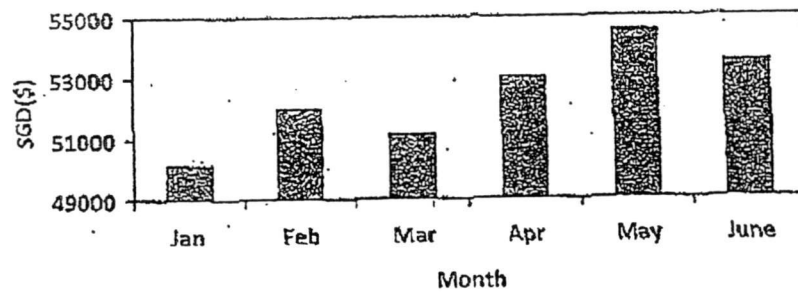
Answer

.. cm [2]



- 12 The bar graph shows the COE price of small cars in Singapore over a period of 6 months.

COE PRICE OF SMALL CARS IN SINGAPORE



State one aspect of the graph that may be misleading and explain how this may lead to a misinterpretation of the graph.

Answer

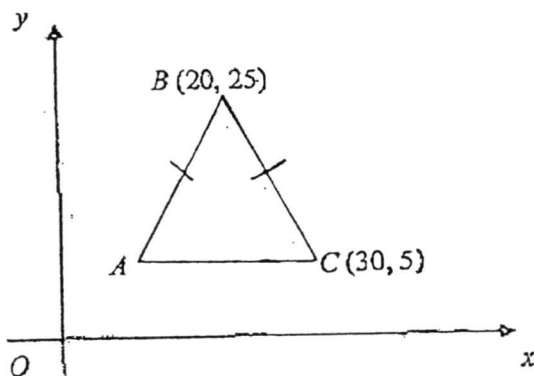
.....

..... [2]

- 13 The diagram shows an isosceles triangle.

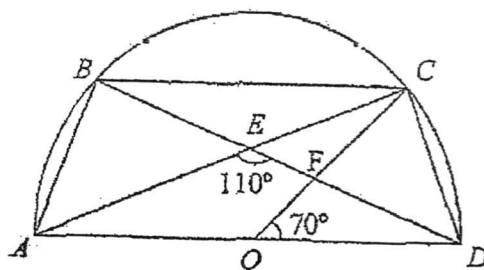
AC is parallel to the x -axis.

Point B has coordinates $(20, 25)$ and C has coordinates $(30, 5)$



Find the coordinates of A .

Answer (.....) [1]



$ABCD$ is a semicircle with centre O .

BED and AEC are straight lines.

Angle $COD = 70^\circ$ and angle $AED = 110^\circ$.

(a) Stating your reasons clearly, calculate

(i) angle ACD ,

Answer angle $ACD = \dots\dots\dots [1]$

(ii) angle ADC ,

Answer angle $ADC = \dots\dots\dots [1]$

(iii) angle ABC ,

Answer angle $ABC = \dots\dots\dots [1]$

(iv) angle BFC .

Answer angle $BFC = \dots\dots\dots [3]$

(b) Explain why BC is parallel to AD .

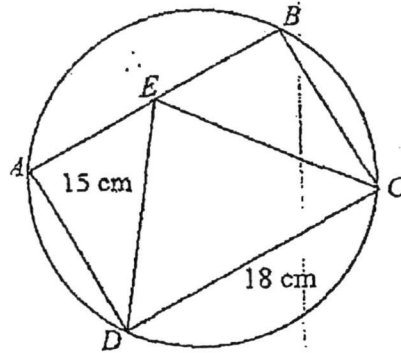
Answer $\dots\dots\dots$
 $\dots\dots\dots [1]$

- 15 The diagram shows a circle $ABCD$.

E is the midpoint of the chord AB .

$ABCD$ is a rectangle.

$DE = 15$ cm and $DC = 18$ cm.



- (a) Calculate the area of triangle ADE .

Answer

..... cm² [2]

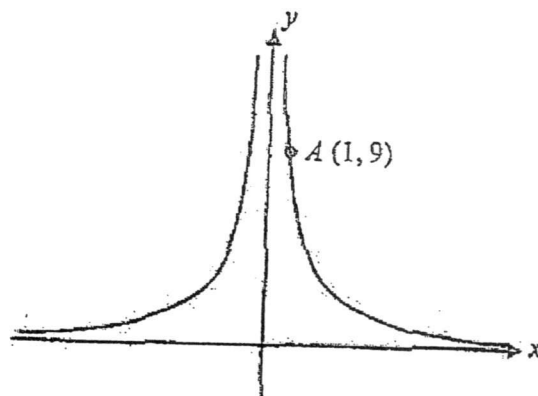
- (b) Calculate the circumference of the circle.

Answer

..... cm [2]



- 16 The sketch shows the graph of $y = 3^k \times x^{-n}$.
The graph passes through the point $A(1, 9)$.



- (a) (i) State a possible value of n .

Answer $n = \dots\dots\dots$ [1]

- (ii) Find the value of k .

$k = \dots\dots\dots$ [1]

- (b) Given that the coordinates of B is $(-2, 2.25)$, find the length of the line segment AB .

Answer $\dots\dots\dots$ [2]

- 17 (a) Express 3780 as the product of its prime factors.

Answer $\dots\dots\dots$ [1]

- (b) Using your answer to part (a), explain why 3780 is not multiple of 49.

Answer $\dots\dots\dots$ [1]

- (c) c is a composite number and p is a prime number.

Find the values of p and c such that $3780 \times \frac{c}{p}$ is a perfect square and c has the least value.

Answer $p = \dots\dots\dots$

$c = \dots\dots\dots$ [2]

- 18 A map of Singapore is such that 9 cm^2 on the map represents the actual area of 36 km^2 on the land.
- (a) Express the scale of the map in the form $1 : n$.

Answer 1 : [2]

- (b) The length of Bukit Timah Expressway on the map is 5 cm.
Calculate the actual distance, in kilometres, of the Bukit Timah Expressway.

Answer km [1]

- 19 The table shows the prices of one litre of petrol and the discounts offered by leading petrol companies

Company	Petrol price per litre	Discount
A	\$1.723	18%
B	\$1.689	15%
C	\$1.702	12% discount plus \$3 off for every \$30 sale after discount

- (a) Ronn wants to fill up his car with 55 litres of petrol at Company C.
Calculate the total amount Ronn paid for the petrol.

Answer \$ [2]

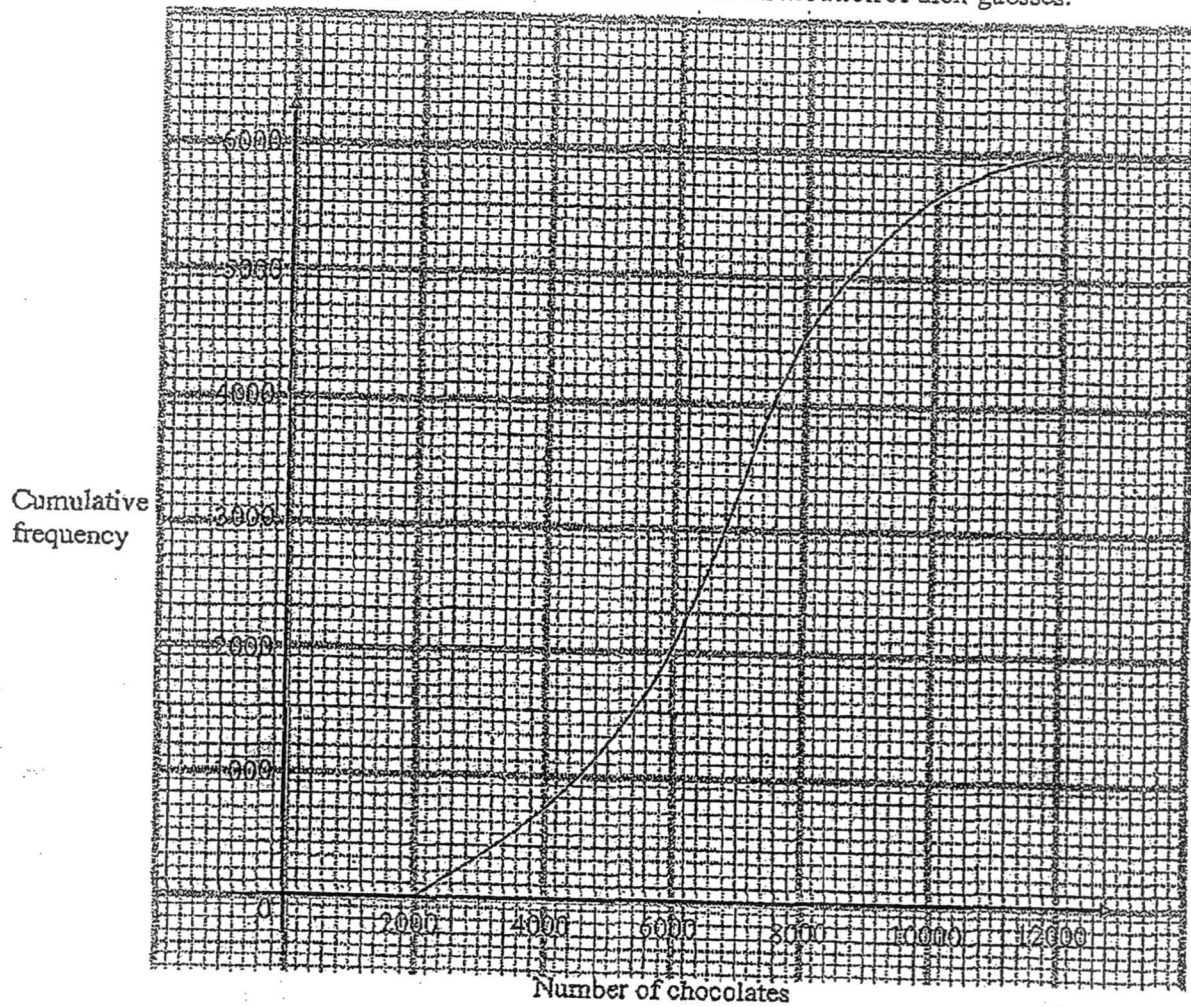
- (b) Comparing Company A and B, show clearly which company offers a better deal.

Answer [2]



- 20 6000 customers participated in a contest where they have to guess the number of chocolates in a big glass container.

The cumulative frequency curve below shows the distribution of their guesses.



The actual number of chocolates is 6000.

- (a) Find the median.

Answer chocolates [1]

- (b) Find the interquartile range.

Answer chocolates [1]

- (c) Find the probability that a customer, chosen at random, gave an estimate within 10% of the actual number of chocolates.

Answer [3]

- 21 Gate B and Gate C are 400 m apart in a park. Gate A is such that angle $ACB = 105^\circ$ and $AB = 550$ m.

(a) Using a scale of 1 cm to 50 m and the line BC is drawn for you, complete the scale drawing of triangle ABC . [1]



- (b) A pavilion, inside the park, is located equidistant from the three gates. By construction, find and label the position of the pavilion P . [2]
- (c) Measure and calculate the actual distance between Gate A and the pavilion P .

Answer m [1]



- 22 The position vectors of A and B are $\begin{pmatrix} 3 \\ 4 \end{pmatrix}$ and $\begin{pmatrix} -3 \\ 4 \end{pmatrix}$ respectively.

(a) Find the length of $\overrightarrow{OB}$.

Answer [1]

- (b) C is the point $(0, p)$ where $p > 0$.

$$\overrightarrow{OC} = 4\overrightarrow{OA} + 4\overrightarrow{OB}.$$

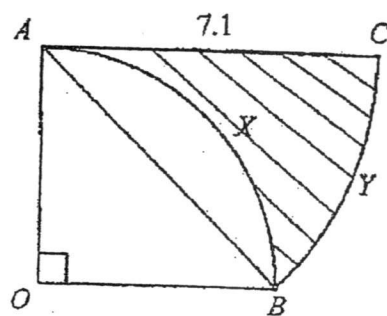
Find the value of p .

Answer $p =$ [2]

- (c) What type of quadrilateral is $OACB$?

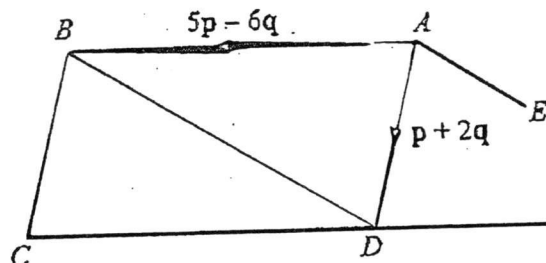
Answer [1]

- 23 In the diagram, angle $AOB = 90^\circ$; AC is parallel to OB and $AC = 7.1$ cm.
 AXB is an arc of a circle with centre O and CYB is an arc of a circle with centre A .
 Find the area of the shaded region.



Answer cm^2 [5]

- 24 In the diagram, $ABCD$ is a parallelogram, $\overrightarrow{AD} = p + 2q$ and $\overrightarrow{AB} = 5p - 6q$.



- (a) Express, as simply as possible, in terms of p and q ,

(i) $\overrightarrow{CB}$,

Answer [1]

(ii) $\overrightarrow{DB}$.

Answer [2]

- (b) E is a point such that $\overrightarrow{EA} = p - 2q$.

- (i) Explain why $\overrightarrow{DB}$ is parallel to $\overrightarrow{EA}$.

Answer [1]

- (ii) Find the ratio of the area of triangle ADE to the area of triangle DBA .

Answer : [2]

End of Paper

MATHEMATICAL FORMULAE

Compound Interest

$$\text{Total amount} = P \left(1 + \frac{r}{100} \right)^n$$

Mensuration

$$\text{Curved surface area of cone} = \pi r l$$

$$\text{Surface area of a sphere} = 4 \pi r^2$$

$$\text{Volume of a cone} = \frac{1}{3} \pi r^2 h$$

$$\text{Volume of sphere} = \frac{4}{3} \pi r^3$$

$$\text{Area of triangle ABC} = \frac{1}{2} ab \sin C$$

$$\text{Arc length} = r\theta, \text{ where } \theta \text{ is in radians}$$

$$\text{Sector area} = \frac{1}{2} r^2 \theta, \text{ where } \theta \text{ is in radians}$$

Trigonometry

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

Statistics

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$\text{Standard Deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f} \right)^2}$$

Answer all the questions.

1 (a) (i) Factorise $-3x^2 - 2x + 5$. [1]

(ii) Simplify $\frac{6x+12}{3x^2-15x-42}$. [2]

(b) It is given that $d = \sqrt{\frac{5e-f}{ef}}$.

(i) Find e when $d = 4$ and $f = 2$. [1]

(ii) Express e in terms of d and f . [2]

(c) Solve the equation $\frac{3x+2}{5} - \frac{1}{2} = \frac{x}{2}$. [2]

(d) Solve these simultaneous equations.

$$7x + 4y = -37$$

$$x - 5y = 17$$

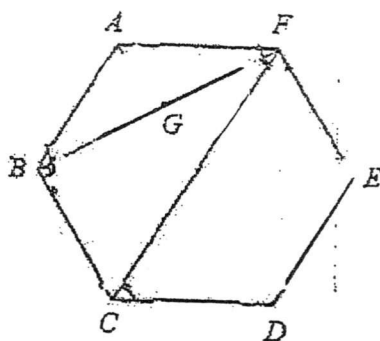
[3]

- 2 In one small packet of gummies, there are both gummy bears and gummy snakes in two colours; red and green. In a large packet, there are 10 small packets.

The information can be represented by the matrix $A = \begin{matrix} & \begin{matrix} \text{Green} & \text{Red} \end{matrix} \\ \begin{matrix} \text{Bear} \\ \text{Snake} \end{matrix} & \begin{pmatrix} 5 & 5 \\ 4 & 6 \end{pmatrix} \end{matrix}$

- (a) Evaluate the matrix $B = 10A$. [1]
- (b) It costs \$0.10 and \$0.12 to produce 1 green and red gummy respectively.
Represent the cost of each colour of gummy in a 2×1 column matrix C in dollars. [1]
- (c) Evaluate the matrix $D = BC$. [1]
- (d) State what the elements of D represent. [1]
- (e) Another gummy-making company, Company Y, packs 6 green gummy bears, 4 red gummy bears, 7 green gummy snakes and 3 red gummy snakes in one small packet. The costs to produce one green gummy and one red gummy remain the same. One large packet is also made up of 10 small packets.
Calculate the total cost for Company Y to produce one large packet. [3]
-

- 3 (a) The diagram shows a regular hexagon.



- (i) Calculate the interior angle of a regular hexagon. [2]
- (ii) It is given that $2AG = BC$. Find $\frac{\text{area of triangle } ABF}{\text{area of triangle } BFC}$. [2]
- (b) (i) Simplify $\frac{(mn^2)^3}{p^5} \div \frac{n^5}{p^4}$. [2]
- (ii) Given that $\frac{2^{q+5}}{4^{2q}} = \frac{1}{16}$, find the value of q . [3]
-

- 4 The first five terms in a sequence of numbers are given below.

0, 3, 8, 15, 24...

- (a) Find the next two terms. [2]
- (b) Find an expression, in terms of n , for the n th term, T_n , of the above sequence. [1]
- (c) T_n and T_{n+1} are consecutive terms in the sequence.
Find and simplify an expression, in terms of n , for $T_{n+1} - T_n$. [3]
- (d) Explain why two consecutive terms of the sequence cannot have a difference of 8. [2]

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

The variables x and y are connected by the equation

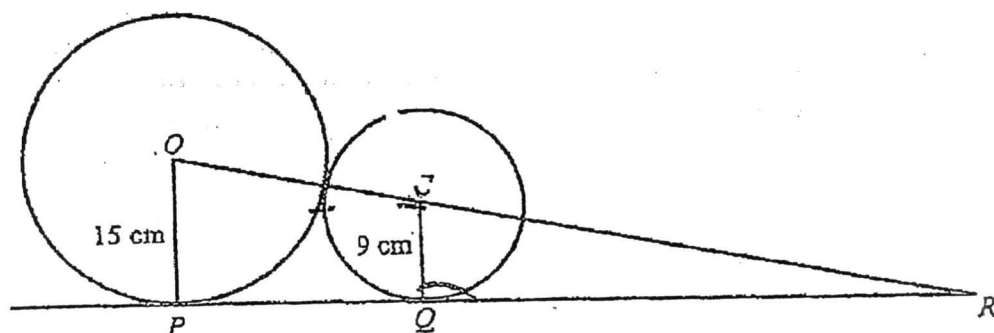
$$y = x^3 - 4x^2 + \frac{5}{2}$$

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

x	-1.5	-1	-0.5	0	0.5	1	1.5	2
y	-9.875	-2.5	1.375	2.5	p	-0.5	-3.125	-5.5

- (a) Find the value of p . [1]
- (b) Using a scale of 4 cm to represent 1 unit, draw a horizontal x -axis for $-1.5 \leq x \leq 2$.
Using a scale of 1 cm to represent 1 unit, draw a vertical y -axis for $-12 \leq y \leq 4$.
On your axes, plot the points given in the table and join them with a smooth curve. [3]
- (c) Use your graph to find the coordinates of the maximum point of $y = x^3 - 4x^2 + \frac{5}{2}$, in the range of $-1.5 \leq x \leq 2$. [1]
- (d) Use your graph to find the solutions to the equation $x^3 - 4x^2 + 6 = 0$, in the range $-1.5 \leq x \leq 2$. [3]
- (e) By drawing a tangent, find the gradient of the curve at $(-1, -2.5)$. [2]
- (f) (i) On the same axes, draw the line $y = -3x - 4$ for $-1.5 \leq x \leq 2$. [1]
(ii) Write down the coordinates of the point where this line intersects the curve. [1]
-

- 6 The diagram shows a circle, centre O , with radius 15 cm touching another circle, centre C , with radius 9 cm.
 OCR and PQR are straight lines and PQR is a tangent to both the circles at points P and Q .



- (a) State the value of angle CQR and explain your answer. [2]
- (b) Show that triangles OPR and CQR are similar.
 Give a reason for each statement you make. [2]
- (c) Find the value of $\frac{\text{area of triangle } CQR}{\text{area of trapezium } OCQP}$ [2]
- (d) Find the difference in the areas of the two circles.
 Leave your answer in terms of π . [2]
-

7 A company manufactures and sells posters for decoration and display.

- (a) The posters manufactured by the company are sold in local shops and department stores. In a particular week, the number of posters available for sale in local shops and department stores are in the ratio 3 : 7.

Given that 160 more posters are available for sale in department stores, find the total number of posters available for sale in that week.

[2]

- (b) A shop owner bought x posters for \$60 from the company.

- (i) Write down an expression, in terms of x , for the cost of each poster in dollars. [1]

The shop owner decides to sell the posters at a profit of \$1 each.

- (ii) Write down an expression, in terms of x , for the selling price of each poster in dollars.

[1]

The shop owner managed to sell 10 posters at the selling price in (ii).

He decided to sell the rest of the posters at \$5 each.

- (iii) Write down an expression, in terms of x , for the total amount of money in dollars, that he collected from the sale of all posters.

[1]

- (iv) Given that the shop owner collected a total of \$130 from the sale of all posters, write down an equation in x to represent this information and show that it reduces to

$$x^2 - 34x + 120 = 0$$

[3]

- (v) Solve the equation $x^2 - 34x + 120 = 0$.

[3]

- (vi) Find the cost price of each poster.

[1]



- 8 The diagram shows a table used by an interior designer.

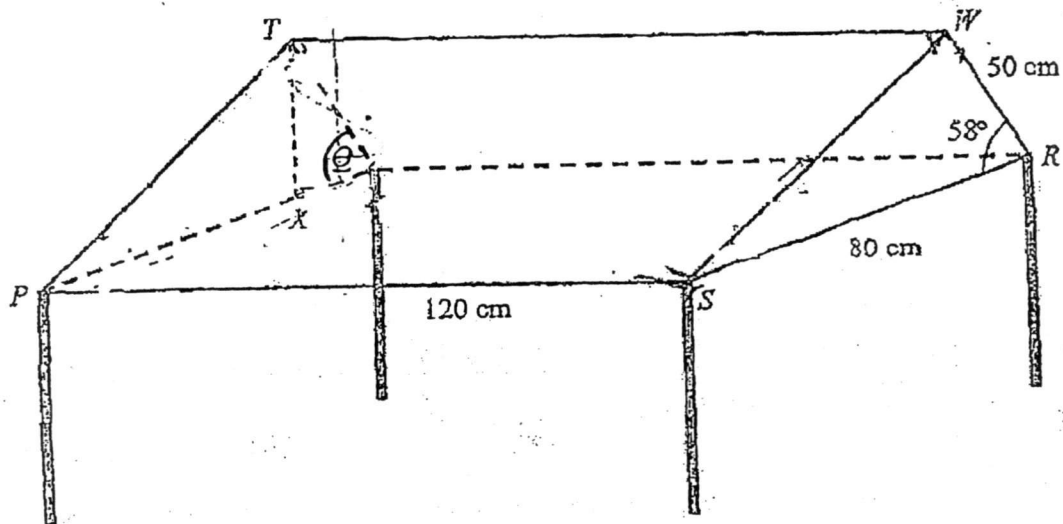
It is made up of a prism and 4 table legs for support.

The rectangle $PQRS$ lies on a horizontal plane.

T is vertically above X .

$PS = 120$ cm, $RS = 80$ cm and $WR = 50$ cm.

Angle $WRS = 58^\circ$.



Calculate

(a) WS ,

[3]

(b) the volume of the prism,

[3]

(c) TX ,

[2]

(d) XS ,

[4]

(e) the angle of elevation of T from S .

[2]

- 9 (a) The amount of money, in dollars, spent by a group of 20 students (Group A) in the month of May is shown in the stem-and-leaf diagram below.

5	2	5			
6	2	3	7		
7	1	1	5	8	9
8	0	4	5	6	
9	2	3	8	9	
10	5	8			

Key 5|6 means \$56

- (i) Find the mean amount of money spent by the 20 students. [1]
 (ii) Find the standard deviation of the amount of money spent by the 20 students. [1]
 (iii) The mean and standard deviation of the amount of money spent by another group of 20 students (Group B) in May were \$70 and \$12 respectively.

Use the information to comment on two differences between the two distributions. [2]

- (b) John plays a game at a carnival. In this game, he has to pick 2 coloured balls from two bags, A and B. He is only allowed to pick one ball from each bag. He has to pick one ball from Bag A, followed by another ball from Bag B.

Bag A contains 2 red balls, 3 blue balls and 6 yellow balls.

Bag B contains 4 red balls, 1 blue ball and 4 yellow balls.

- (i) Draw a tree diagram to show the probabilities of the possible outcomes. [2]
 (ii) John will win a large prize if he picks 2 balls that are blue, a small prize if he picks only one ball that is blue and goes home empty-handed otherwise.
 Find, as a fraction in the simplest form, the probability that
 (a) John will win a large prize, [1]
 (b) John will win a small prize, [1]
 (c) John will not win anything. [1]

- 10 A group of students are tasked to design, print and distribute brochures containing tips to save water to students in school, as part of the school's effort to raise awareness of the importance of saving water in school.

The students have been allocated a budget of \$1200 to complete this task.

The students are required to print and distribute a copy of the brochure to each student and teacher in the school.

Each brochure is printed on both sides of 2 sheets of A4 size paper.

Students will be given brochures printed in black and white and teachers will be given brochures printed in colour. They will have to purchase the sheets of A4 size paper and toner cartridges from *ABC* bookstore, which will be delivered to school.

In addition, the students are also tasked to design and print 50 copies of A3 size coloured posters containing tips to save water, to be put up in all classrooms and various areas in the school. They have sourced for an external supplier, *XYZ* supplier, to print the posters. The posters will be delivered to school as well.

The information that the students require is found in Annex A, on the opposite page.

The students estimates that they have to distribute the brochures to 1360 students and 90 teachers.

- (a) How many sheets of A4 size paper will the students require to purchase to print the brochures for all students and teachers? [1]
- (b) How many toner cartridges will the students require to purchase to print the brochures for all students and teachers? [3]
- (c) Given that one of the students in the group is a member of *ABC* bookstore and that the students aim to reduce the cost as far as possible, determine if the amount of budget allocated is sufficient to cover all costs.
Justify your answer with relevant mathematical working. [6]

1) Cost of purchasing stationaries from ABC Bookshop:

Item	Description	Unit Cost (excluding GST)
A4 Paper	White paper	
	1 pack of 100 sheets	\$2.00
	1 pack of 500 sheets	\$5.00
	5 packs of 500 sheets each	\$22.50
	10 packs of 500 sheets each	\$42.00
Toner Cartridges	Black printing (each cartridge is able to print 1200 pages)	\$136.00
	Colour printing (each cartridge is able to print 900 pages)	\$140.00
The above prices are subjected to 7% Goods and Services Tax (GST).		
Member discount: 10% off total bill, after 7% GST		
Delivery cost: \$30 per trip (not subjected to 7% GST)		
(Free delivery for minimum purchase of \$200 in total bill, inclusive of 7% GST and after member discount.)		

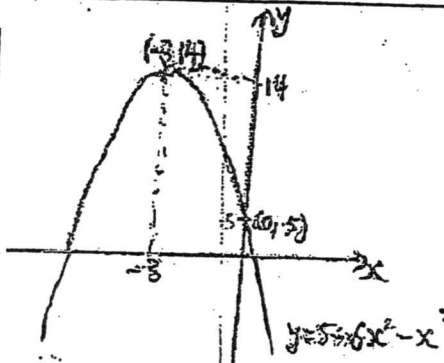
2) Cost of printing A3 size coloured posters

Supplier: XYZ Printing

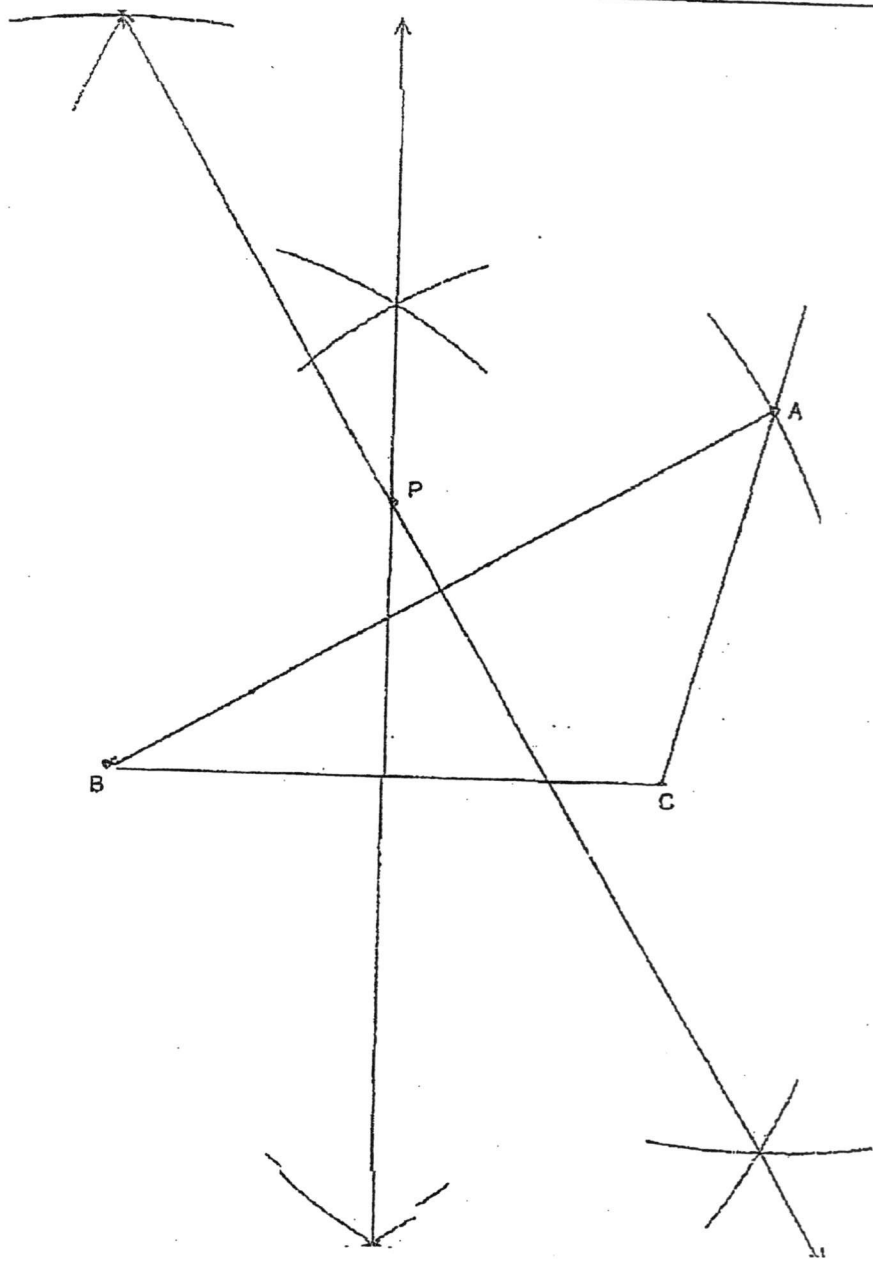
Item	Description	Unit Cost (excluding GST)
Black and White Posters	10 sheets	\$25.00
	50 sheets	\$120.00
Coloured Posters	10 sheets	\$35.00
	50 sheets	\$170.00
The above prices are subjected to 7% Goods and Services Tax (GST).		
Delivery cost: \$20 per trip (not subjected to 7% GST)		
(Free delivery for minimum purchase of \$200 in total bill, inclusive of 7% GST.)		

End of Paper

Pei Hwa Secondary School
Mid Year Examination 2017
Sec 4E & 5N Mathematics Paper 1
Answer Key

1(a)	$A' \cap B$
2(a)	$-2x^2 + x + 3$
2(b)	$2(4a+3b)(4a-3b)$
3	$(4b-3a)(3x+2y)$
4	$\frac{11x-10}{(x+2)(x-2)}$
5	$(7p-3)^2 - 4p(p-3) + 6$ $= 49p^2 - 42p + 9 - 4p^2 + 12p + 6$ $= 45p^2 - 30p + 15$ $= 15(3p^2 - 2p + 1)$ $\therefore$ for all p, $(7p-3)^2 - 4p(p-3) + 6$ is divisible by 15. (Shown)
6(a)	$14 - (x+3)^2$
6(b)	
7(a)	\$5.50
7(b)	4 hours
8	29.6 cm^3 (3s.f.)
9	119.0° (1d.p.)
10	Amount of money Jane will get in Singapore $= \frac{1426}{0.71}$ $= \text{SGD\$}2008.45$ Amount of money Jane will get in the United States $= \frac{153}{100} \times 1426$ $= \text{SGD\$}2181.78$

	Jane will change her money in the <u>United States</u> as she will get back more Singapore dollars.
11	7 cm
12	In the graph, the data doesn't start at \$0, but somewhere around \$49000. This makes the differences appear much larger proportionally.
13	(10, 5)
14(a)(i)	90°
14(a)(ii)	55°
14(a)(iii)	125°
14(a)(iv)	75°
14(b)	Angle $BCE = 35^\circ$ (Angles in the same segment) Since angle $BCE =$ angle CAO (by property of alternate angles), BC is parallel to AD .
15(a)	54cm^2
15(b)	68.0cm
16(a)(i)	$n = -2$
16(a)(ii)	$9 = 3^k \times (1)^{-2}$ $k = 2$
16(b)	7.39 units
17(a)	$2^2 \times 3^3 \times 5 \times 7$
17(b)	Index of 7 is not at least 2
17(c)	$c = 15$ $p = 7$
18(a)	1 : 200000
18(b)	10 km
19(a)	\$76.38
19(b)	Company B offers a better deal.
20(a)	6800
20(b)	2600
20(c)	$\frac{1}{5}$

21a,b	
21(c)	Distance $= 5.7 (\pm 0.1) \times 50$ $= 285 (\pm 5) \text{ m}$
22(a)	5 units
22(b)	$p = 32$

22(c)	Kite
23	12.6 cm^2
24(a)(i)	$-p - 2q$
24(a)(ii)	$4p - 8q$
24(b)(i)	$\overrightarrow{DB}$ $= 4(p - 2q)$ $= 4 \overrightarrow{EA}$
24(b)(ii)	$\frac{1}{4}$

PHSS 4E EM MYE Paper 2 2017 Answer Key

No.	Answer
1(a)(i)	$-3x^2 - 2x + 5 = (3x + 5)(1 - x)$
1(a)(ii)	$\frac{2}{x-7}$
1(b)(i)	$d = 1.5$ or $d = 1\frac{1}{2}$
1(b)(ii)	$e = \frac{f}{5 - d^2 f}$
1(c)	$x = 1$
1(d)	$x = -3, y = -4$
2(a)	$B = \begin{pmatrix} 50 & 50 \\ 40 & 60 \end{pmatrix}$
2(b)	$C = \begin{pmatrix} 0.10 \\ 0.12 \end{pmatrix}$
2(c)	$D = \begin{pmatrix} 11 \\ 11.2 \end{pmatrix}$
2(d)	The elements of D represent the cost to produce all the gummy bears and gummy snakes in a large packet respectively.
2(e)	Total cost = \$10.80 + \$10.60 = \$21.40
3(a)(i)	120°
3(a)(ii)	$\frac{1}{2}$
3(b)(i)	$\frac{m^3 n}{p}$
3(b)(ii)	$q = 3$
4(a)	$T_6 = 35$ $T_7 = 48$
4(b)	$T_n = n^2 - 1$ or $(n+1)(n-1)$
4(c)	$T_{n+1} - T_n = n^2 + 2n - (n^2 - 1)$ = $2n + 1$

No.	Answer
4(d)	$2n + 1 = 8$ $n = 3.5$ Assuming that the difference between two terms is 8, the first consecutive term is 3.5, which does not exist. Therefore, two consecutive terms cannot have a difference of 8. OR The difference $(2n + 1)$ is an odd number. Therefore, two consecutive terms cannot have a difference of 8, which is an even number.
5(a)	$p = 1.625$
5(b)	If all 8 points plotted correctly, otherwise, at least 6 points plotted correctly. Smooth curve
5(c)	Maximum point = $(0, 2.5)$
5(d)	From the graph, $x = -1.10 \pm 0.10$ and $x = 1.55 \pm 0.10$
5(e)	Gradient = 8.67 ± 3
5(f)(i)	Correctly drawn line
5(f)(ii)	$(-0.85, -1.4)$
6(a)	$\angle CQR = 90^\circ$ tangent perpendicular to radius
6(b)	$\angle OPR = 90^\circ$ (tangent perpendicular to radius) $\angle OPR = \angle CQR$ $\angle PRO = \angle QRC$ (common angle) $\angle POR = \angle QCR$ (corresponding angles, $OP \parallel CQ$) Hence, triangle OPR is similar to triangle CQR . (AA Similarity)
6(c)	$\frac{9}{16}$
6(d)	$144\pi \text{ cm}^2$
7(a)	400
7(b)(i)	$\$ \left(\frac{60}{x} \right)$
7(b)(ii)	$\$ \left(\frac{60}{x} + 1 \right)$
7(b)(iii)	$\frac{600}{x} + 5x - 40$

7(b)(iv)	$\frac{600}{x} + 10 + 5x - 50 = 130$ $\frac{600}{x} + 5x - 170 = 0$ $600 + 5x^2 - 170x = 0$ $5x^2 - 170x + 600 = 0$ $x^2 - 34x + 120 = 0 \text{ (shown)}$
7(b)(v)	$x = 30$ or $x = 4$
7(b)(vi)	\$2
8(a)	68.3 cm
8(b)	204000 cm ³
8(c)	$TX = 42.4$ cm
8(d)	$XS = 131$ cm
8(e)	$\theta = 17.9^\circ$
9(a)(i)	\$80.15
9(a)(ii)	\$15.60
9(a)(iii)	1. The mean amount of money spent by students in Group A is higher than that of Group B. On average, students in Group A spent more money than students in Group B. 2. The standard deviation of the amount of money spent by students in Group B is lower than that of Group A. There is a smaller spread in the amount of money spent by students in Group B. / The amount of money spent by students in Group B is more consistent.

9(b)(i)	Bag A Bag B
9(b)(ii)(a)	$\frac{1}{33}$
9(b)(ii)(b)	$\frac{32}{99}$
9(b)(ii)(c)	$\frac{64}{99}$
10(a)	2900
10(b)	6
10(c)	<u>Cost of purchase from ABC Bookstore</u> Total cost with delivery cost, after member discount = \$816.1425 <u>Cost of purchase from XYZ Printing</u> Total cost with delivery = \$20 + \$181.90 = \$201.90 Grand total cost = \$816.1425 + \$201.90 = \$1018.04 The amount of budget of \$1200 is <u>sufficient</u> to cover all costs.