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Name:	Register No.:	Class:
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**CRESCENT GIRLS' SCHOOL
SECONDARY FOUR
PRELIMINARY EXAMINATION**

MATHEMATICS

Paper 1

4048/01

15 Aug 2016

2 hours

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your name, register number and class on all the work you hand in.

Write in dark blue or black pen.

You may use a pencil for any diagrams or graphs.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer all questions.

If working is needed for any question it must be shown with the answer.

Omission of essential working will result in loss of marks.

Calculators should be used where appropriate.

If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.

For π , use either your calculator value or 3.142, unless the question requires the answer in terms of π .

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

The total of the marks for this paper is 80.

For Examiner's Use
80

Answer all the questions.

- 1 The lowest common multiple of 3 numbers is 9000.
Two of the numbers are 24 and 125.
Write down the least possible value of the third number.

Answer [2]

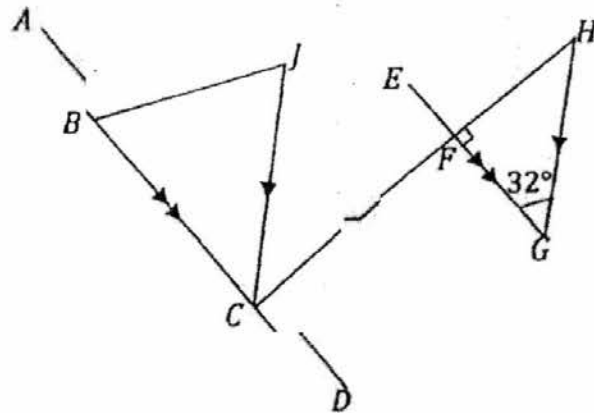
- 2 (a) Given that $6^a + 6^a + 6^a + 6^a = 5184$, find the value of a .

Answer (a) $a =$ [2]

- (b) The diameter of a human cell is 3×10^{-8} kilometres.
The diameter of a hydrogen atom is 2.4×10^{-4} micrometres.
How many times is the diameter of the human cell bigger than the diameter of the hydrogen atom? Give your answers in standard form.

Answer (b) [1]

- 3 In the diagram below, $ABCD$ is a straight line, $BC = JC$ and $\angle HGE = 32^\circ$. AD is parallel to EG and HG is parallel to JC . HC cuts EG at F and HC is perpendicular to EG .



- (a) Find $\angle JCH$.

Answer (a) $\angle JCH = \dots\dots\dots^\circ$ [1]

- (b) Find $\angle JBA$.

Answer (b) $\angle JBA = \dots\dots\dots^\circ$ [1]

- 4 The table shows the number of accidents involving cars and motorcycles from April to June.

	April	May	June
Car	130	121	110
Motorcycles	74	87	107

Aminah concludes that it is more dangerous to drive a car than to ride a motorcycle because there are more accidents involving cars.

Do you agree with her? Give two reasons for your answer.

Answer

.....

.....

.....

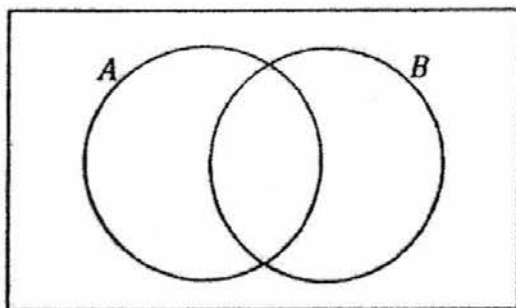
.....[2]

- 5 The amount of pressure is inversely proportional to the base area of a cube. The pressure is 100 Pa when the length of the cube is l cm. Find the new pressure when the length of the cube is increased by 300%.

Answer Pa [2]

- 6 (a) On the Venn Diagram shown in the answer space, shade the set of $(A \cap B')'$.

Answer



[1]

- (b) $E = \{x : x \text{ is an integer and } 0 \leq x \leq y\}$,

$P = \{x : x \text{ is a perfect square}\}$,

$Q = \{x : x \text{ is an even number}\}$,

$R = \{x : x \text{ is a multiple of } 3\}$.

Given that $n(P \cap Q) = 5$ and $n(Q \cap R) = 17$, list all the possible values of y .

Answer (b) [2]

- 7 Three of the exterior angles of an n -sided polygon are 35° , 40° and 60° . The other exterior angles are 45° each.

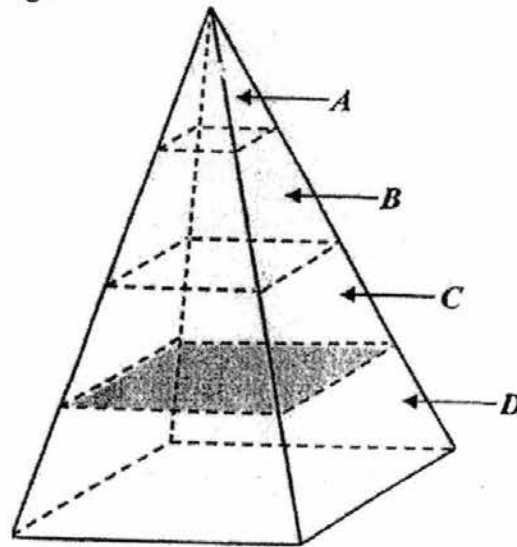
- (a) Find the value of n .

Answer (a) $n =$ [2]

- (b) Name this polygon.

Answer (b) [1]

- 8 The diagram below shows a solid pyramid which is cut horizontally into four portions, A , B , C and D of equal heights.



- (a) If the base area of A is 13 cm^2 , find the shaded base area of portion C .

Answer (a) cm^2 [2]

- (b) If the volume of portion C is 47.5 cm^3 , find the volume of the whole pyramid.

Answer (b) cm^3 [2]

- 9 (a) Factorise completely $-x^2 + 3x - 2$.

Answer (a) [1]

- (b) Hence, factorise completely $12x^4 - 36x^2 + 24$.

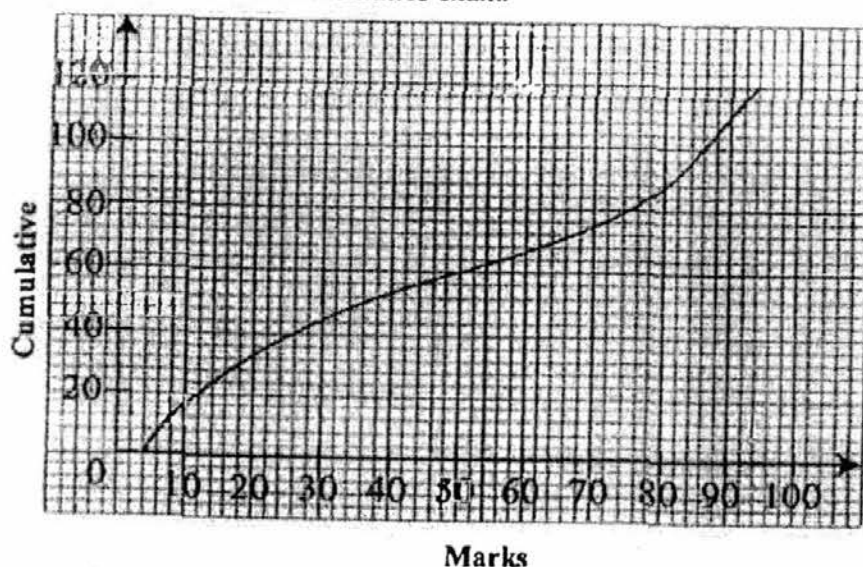
Answer (b) [3]

- 10 Given that $x^2 + x - 4 = 0$.

Without solving for x , find the value of $x^3 + 5x^2 + 2016$.

Answer [3]

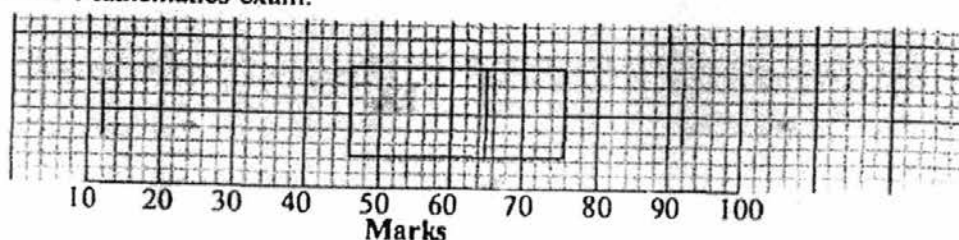
- 11 The cumulative frequency curve below shows the distribution of the marks scored by students in School X for a Mathematics exam.



- (a) Use your graph to find the median mark.

Answer (a) [1]

- (b) The box-and-whisker plot below shows the marks scored by students in School Y for the same Mathematics exam.



- (i) Find the interquartile range for School Y.

Answer (b)(i) [1]

- (ii) A greater proportion of students scored more than 80 marks in School X as compared to School Y.

Write whether you agree or disagree with the statement above and give a reason for your answer, stating clearly which statistic you use to make your decision.

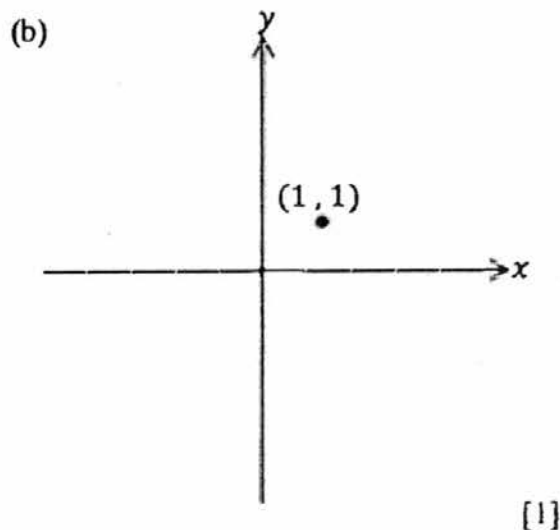
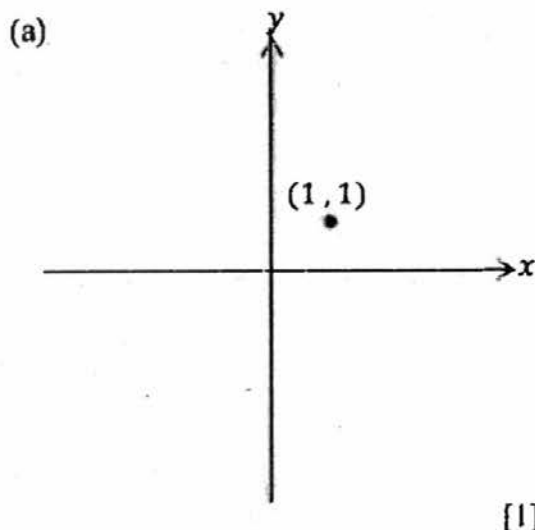
Answerbecause [1]

- 12 In the axes provided below, the point (1, 1) has been marked. Indicating clearly any intercepts, sketch the graphs of

(a) $y + x^2 = 1$,

(b) $y + 1 = 7^x$.

Answer

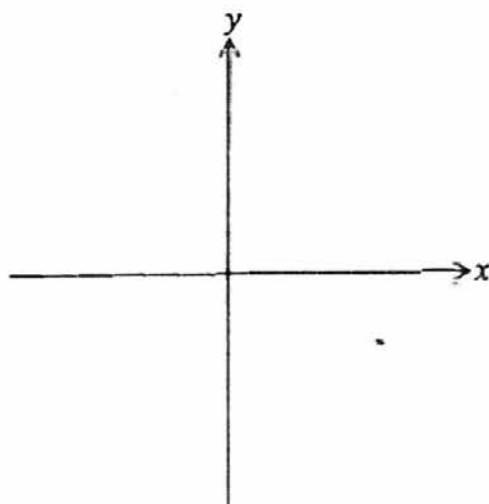


- 13 (a) Express $3x^2 - 24x + 37$ in the form of $a(x - h)^2 + k$.

Answer (a) [1]

- (b) Hence, sketch the graph of $y = 3x^2 - 24x + 37$ in the space below, indicating clearly any intercepts.

Answer



[2].

- 14 A television set in a shop has a marked price of \$ y .
It was finally sold at a discount of $d\%$.
(a) Express the selling price in terms of y and d .

Answer (a) \$ [1]

The shopkeeper made a profit of 20% from the sale of the television set.

- (b) Express the cost price as a single fraction in terms of y and d .

Answer (b) \$ [1]

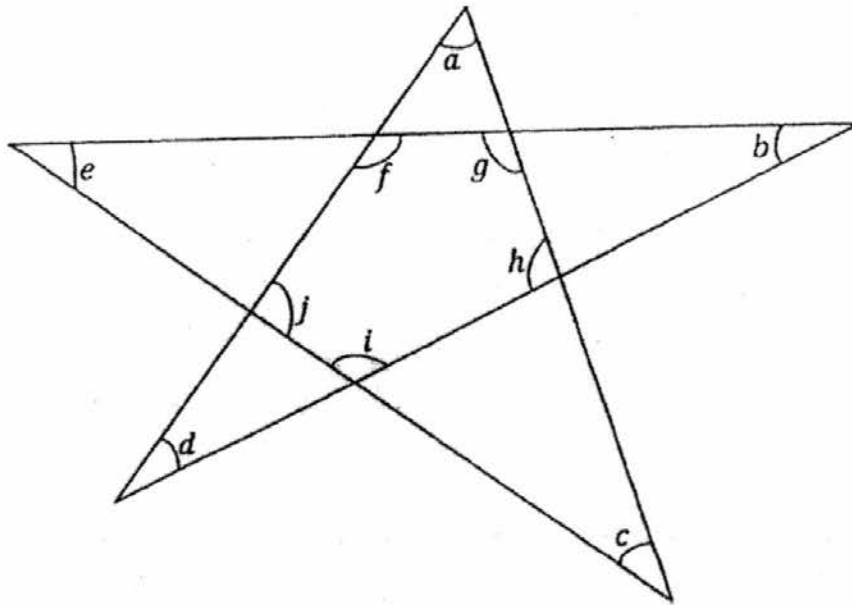
- 15 Mandy is planning to invest some money into EBS Bank that pays an annual interest rate of 2.5%, compounded monthly.
(a) Find the original amount of money Mandy invested if she received an interest of \$1330 at the end of 5 years, giving your answer correct to the nearest dollar.

Answer (a) \$ [2]

- (b) ACBC Bank offers Mandy a simple interest rate of $y\%$ per annum. Using your answer in (a), find the value of y if Mandy earns the same amount of interest in 5 years.

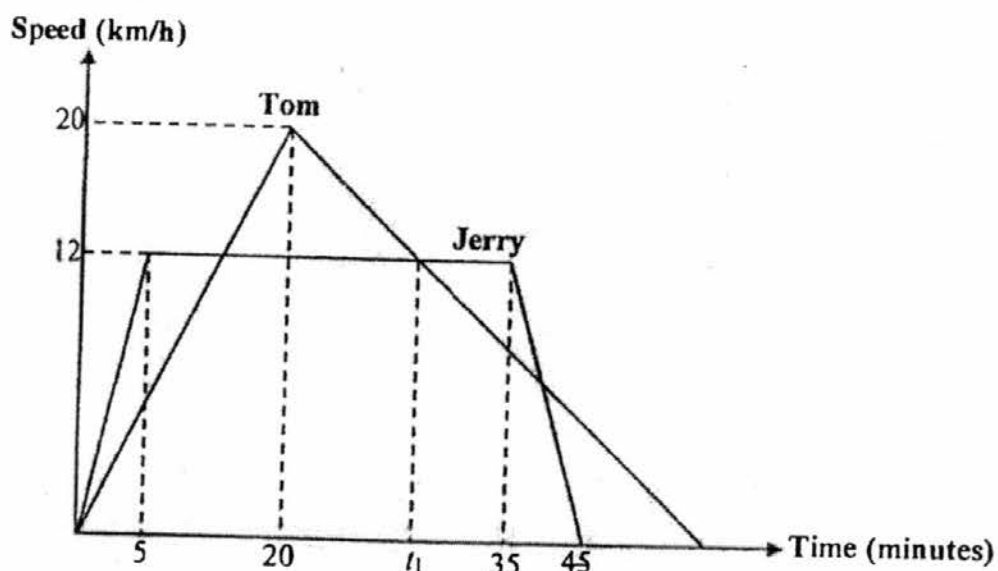
Answer (b) [2]

- 16 Calculate the sum of the angles $a, b, c, d, e, f, g, h, i$ and j in this diagram.



Answer [2]

- 17 The diagram below shows the distance time graph of Tom and Jerry's journey. They both start at the same time and at the same place.



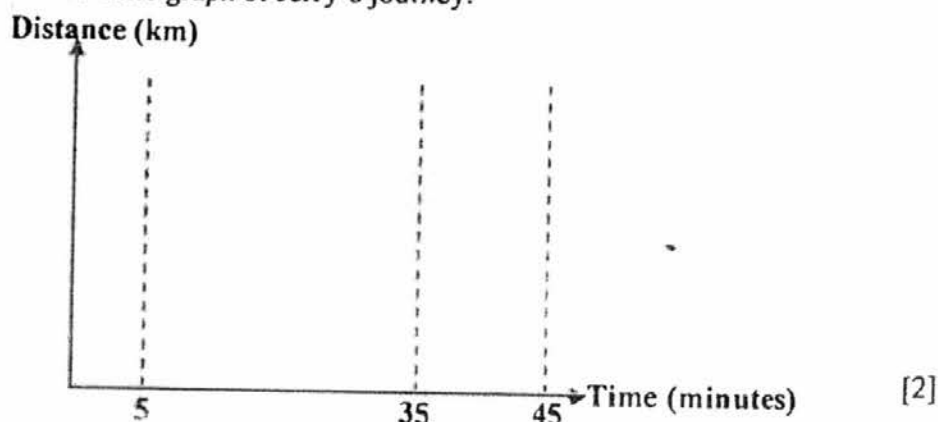
- (a) If Tom overtakes Jerry at t_1 , find the value of t_1 .

Answer (a) $t_1 = \dots\dots\dots$ [2]

- (b) Find Tom's speed at 25 minutes.

Answer (b) $\dots\dots\dots$ km/h [1]

- (c) Sketch the distance-time graph of Jerry's journey.



- 18 Anna can either ride the horse, take the sled or walk to the ice castle.

The probability that Anna take the sled is $\frac{5}{8}$ and the probability that she walks is $\frac{1}{6}$.

If she rides the horse, the probability that she will reach the castle is $\frac{1}{2}$.

If she takes the sled, the probability that she will reach the castle is $\frac{4}{5}$.

If she walks, the probability that she will not reach the castle is $\frac{3}{4}$.

The letters in the box below represent all the different outcomes.

H: Ride the horse	S: Take the sled	W: Walk
R: Reach the castle	NR: Not reach the castle	

- (a) In the space below, draw a probability tree diagram to show all the possible outcomes.

Answer

[2]

- (b) Find the probability that Anna will reach the castle if she takes the sled.

Answer (b) [1]

- (c) Find the probability that Anna will not reach the castle.

Answer (c) [1]

19 Three unbiased dice are thrown.

(a) Find the probability that at least one even number is obtained.

Answer (a) [1]

(b) Find the probability that all three dice show different numbers.

Answer (b) [1]

20 Benjamin ran along the perimeter of his town. The town has an area of 450 cm^2 on a map, and the scale of the map is 1 : 40 000.

(a) Calculate the actual area of the town that Benjamin ran in km^2 .

Answer (a) km^2 [2]

(b) The length of his route is 110 cm on the map. If he ran at a constant speed of 15 km/h, find the total time he took to run along the perimeter of the town.

Leave your answers in hours and minutes.

Answer (b) hours minutes [2]

- 21 The following table shows the number of \$2, \$5 and \$10 notes in the pockets of 4 students, Adam, Bob, Catherine and Dave.

	\$2	\$5	\$10
Adam	4	5	1
Bob	2	5	2
Catherine	3	4	1
Dave	1	3	4

It is given that the information in the table above is represented by the matrix R and $P = \begin{pmatrix} 2 \\ 5 \\ 10 \end{pmatrix}$.

- (a) (i) Evaluate RP .
 (ii) Explain what RP represent.

Answer (a) (i) $RP = \dots\dots\dots [1]$

(ii) $\dots\dots\dots [1]$

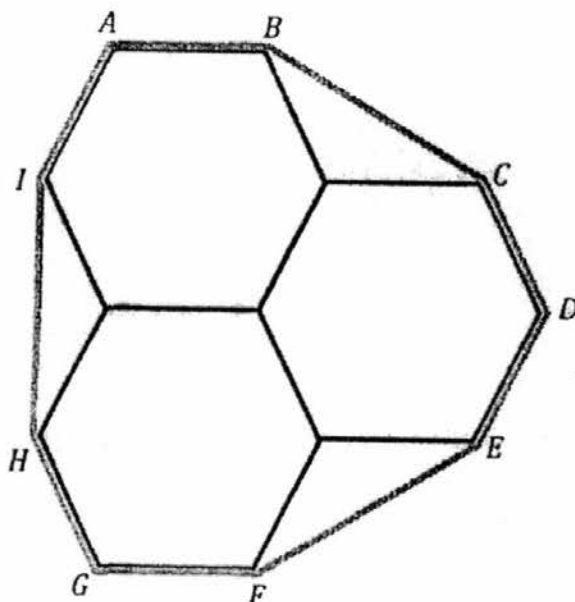
- (b) If RS represent the number of notes each student has, write down the matrix S .

Answer (b) $S = \dots\dots\dots [1]$

- (c) Write down, but do not evaluate, a product of three matrices which will give the total amount of money the 4 students have altogether.

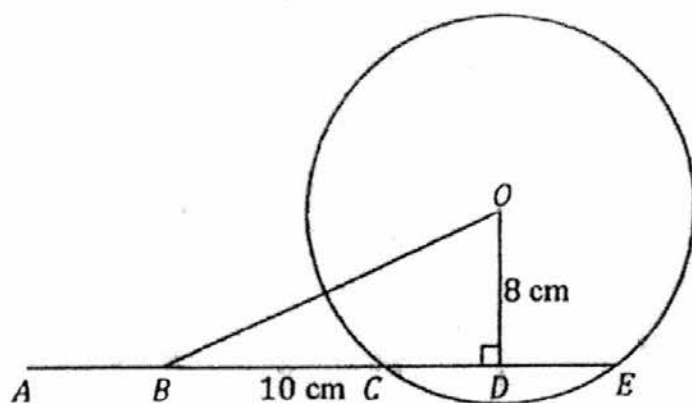
Answer (c) $\dots\dots\dots [1]$

- 22 Three pencils with the cross-section in the shape of a regular hexagon are taped together as shown in the diagram below. The length of the side of each hexagon is 0.5 cm. Find the area of $ABCDEFGHI$.



Answer cm^2 [3]

- 23 The diagram below shows a circle with centre O . It is given that $OD = 8$ cm, $BC = 10$ cm, $\angle ODB = 90^\circ$ and C is the midpoint of BE .



- (a) Find the exact value of
 (i) $\tan \angle OBD$,
 (ii) $\cos \angle OBA$.

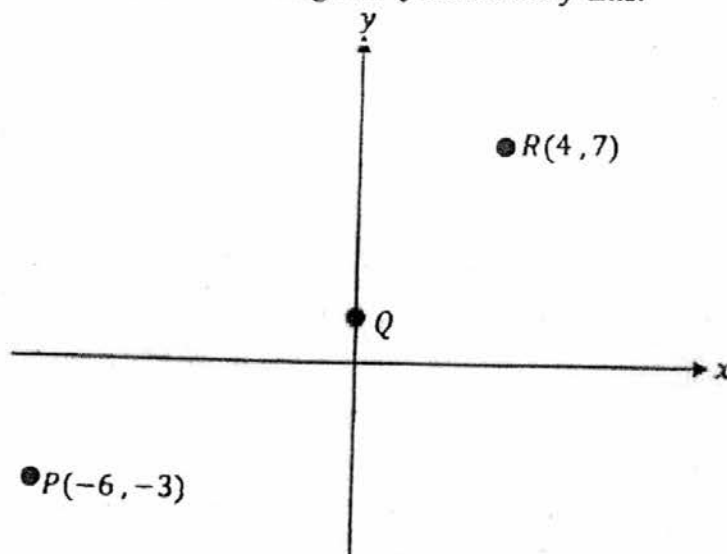
Answer (a) (i) [2]

(ii) [1]

- (b) Find the radius of the circle.

Answer (b) [1]

- 24 The points P , Q and R are shown in the diagram. Q lies on the y -axis.



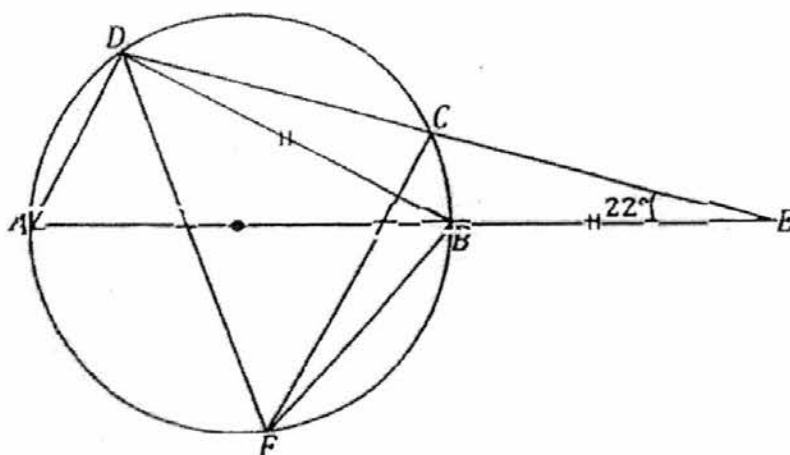
- (a) If the equation of PQ is $3y - 2x = 3$, find the coordinates of Q .

Answer (a) $Q = (\dots\dots\dots , \dots\dots\dots)$ [1]

- (b) (i) The coordinate of S is $(-1, y)$ and $PQRS$ is a trapezium. State the two possible coordinates of S .

Answer (b) (i) Coordinates of $S = (\dots\dots\dots , \dots\dots\dots)$ or $(\dots\dots\dots , \dots\dots\dots)$ [2]

- 25 In the diagram, AB is the diameter of the circle $AFBCD$. E is the point on AB produced where $DB = BE$ and $\angle AED = 22^\circ$. The straight line ED cuts the circle at C .



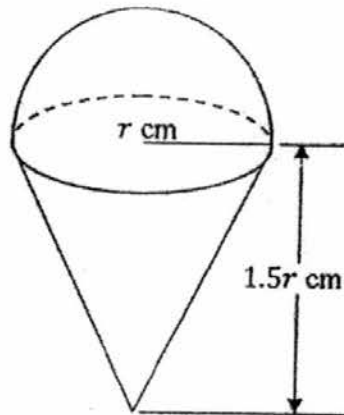
- (a) By explaining your answers clearly, find
 (i) $\angle CFB$,
 (ii) $\angle ABC$.

Answer (a)(i) [1]
 (ii) [1]

- (b) X is a point in the circle such that $\angle DXB = 50^\circ$. Find the position of X , stating your reasons clearly.

Answer (b) X is
 because
 [2]

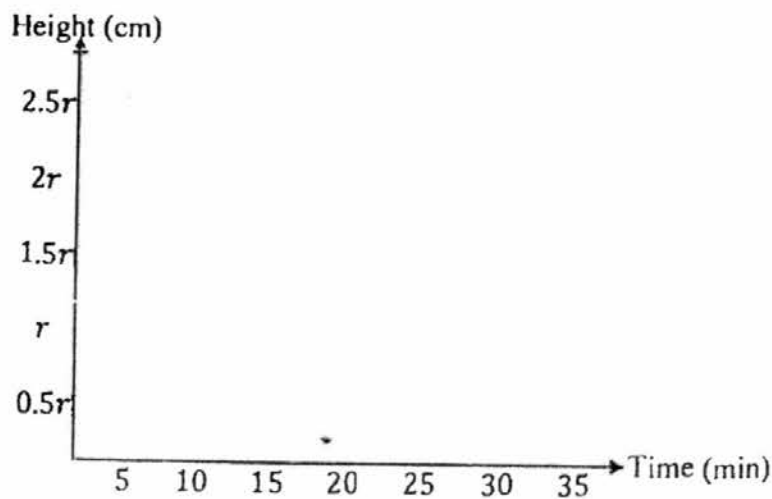
- 26 Liquid metal is poured into a mould in the shape of a cone and a hemisphere as shown in the diagram below. The radius of the cone and hemisphere is r cm and the height of the cone is $1.5r$ cm.



- (a) It took 35 minutes for the liquid metal to completely fill up the mould. Find the time taken to fill up the cone.

Answer (a) minutes [1]

- (b) On the answer grid given below, sketch the graph of the height of the liquid metal against time.



[2]

END OF PAPER

Name:	Register No.:	Class:
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**CRESCENT GIRLS' SCHOOL
SECONDARY FOUR
PRELIMINARY EXAMINATION 2016**

MATHEMATICS

Paper 2

4048/02

16 August 2016

2 hours 30 minutes

Additional Materials: Answer Paper
Graph Paper (1 sheet)
Mark Sheet

READ THESE INSTRUCTIONS FIRST

Write your name, register number and class on all the work you hand in.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer all the questions.

If working is needed for any question it must be shown with the answer.

Omission of essential working will result in loss of marks.

The use of an approved scientific calculator is expected, where appropriate.

If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.

The use of a scientific calculator is expected, where appropriate.

For π , use either your calculator value or 3.142, unless the question requires the answer in terms of π .

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

The total of the marks for this paper is 100.

For Examiner's Use
100

Answer all the questions.

- 1 The heights of 180 girls from School X is shown in the table below.

Height, h (cm)	Frequency
$140 < h \leq 145$	8
$145 < h \leq 150$	15
$150 < h \leq 155$	40
$155 < h \leq 160$	50
$160 < h \leq 165$	27
$165 < h \leq 170$	30
$170 < h \leq 175$	10

- (a) Calculate

- (i) the mean heights of the girls, [1]
- (ii) the standard deviation. [2]
- (iii) Jennifer says that the range of the heights of the 180 girls is 35 cm. Explain why she could be wrong. [1]

- (b) The heights of a group of 175 girls in School Y are measured and summarised below.

Mean height	161.5 cm
Standard deviation	5.06 cm

Make two comparisons between the heights of the girls in School X and School Y .

[2]

- 2 Miss Chong and Miss Noraini are clerks in a food factory in Jurong. They are paid according to normal and overtime rates. Based on company policy, all clerks are required to work 8 normal hours on weekdays and 4 normal hours on Saturdays. Any extra hours put in by the clerks are considered overtime.

If Miss Chong works for 8 hours at normal rate and 2 hours at overtime rate on weekdays, she will be paid \$116.60 per weekday.
On Saturdays, if she works for 4 hours at normal rate and 3 hours at overtime rate, she will be paid \$90.10 per Saturday.

- (a) Let \$ p per hour be Miss Chong's normal pay rate and \$ q per hour be her overtime pay rate.

Form 2 equations in terms of p and q . [2]

- (b) Solve your simultaneous equations to find p and q . [2]

- (c) Miss Noraini is paid the same overtime rate as Miss Chong. Her normal pay rate is 10% less than Miss Chong's as she is junior to Miss Chong.
On a particular week, Miss Noraini is required to work 2.5 hours overtime every day on weekdays and 2 hour overtime on Saturday.

Calculate Miss Noraini's salary for the week. [3]

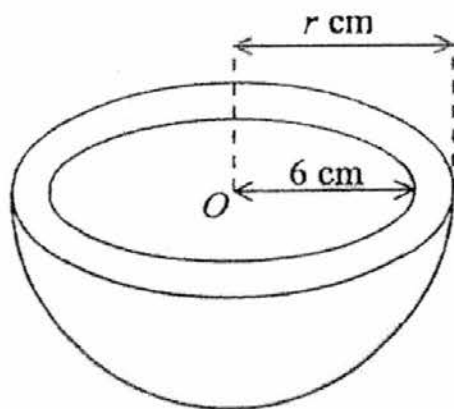
- 3 Study the number pattern below.

Row, n	Pattern, P_n	Sum, S_n	$S_n + 20$
1	5	5	25
2	5, 6, 5	16	36
3	5, 6, 7, 6, 5	29	49
4	5, 6, 7, 8, 7, 6, 5	S_4	$S_4 + 20$

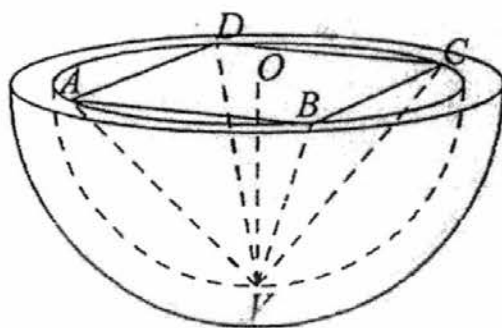
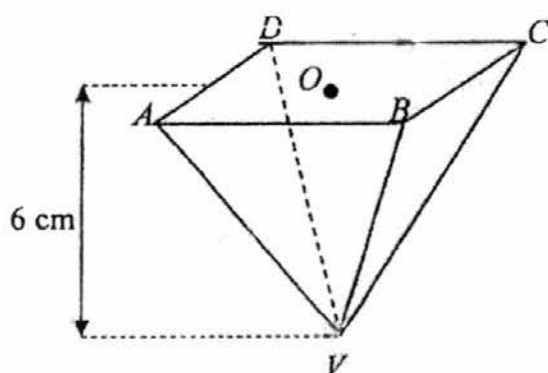
- (a) Write down the values of S_4 and $S_4 + 20$. [2]
- (b) Name the type of numbers under the column $S_n + 20$. [1]
- (c) Give a reason why 89 cannot appear in column $S_n + 20$. [1]
- (d) Express $S_n + 20$ in terms of n . [1]
- (e) (i) Given that
 $5 + 6 + 7 + \dots + (k-1) + k + (k-1) \dots + 7 + 6 + 5 = 269$.
 Write down the value of k . [1]
- (ii) Hence, find the sum of $25 + 30 + 35 + \dots + 85 + \dots + 35 + 30 + 25$. [2]

- 4 (a) (i) Given that $\frac{3}{y} = \sqrt{\frac{h^2 - 5}{y^2 + 8}}$, make y the subject. [3]
- (ii) State the condition such that y is a real value. [1]
- (b) Solve the equation $\frac{x}{x^2 - 6x + 9} - \frac{2x + 9}{2x^2 - x - 15} = 0$. [3]
- (c) Given that $6x^2 - xy = 7y^2$, $x > 0$ and $y > 0$.
 Find the value of $\frac{12x}{y}$. [2]

- 5 The diagram shows a hemispherical clay bowl with centre O .
The inner radius of the bowl is 6 cm and the outer radius is r cm



- (a) Find the internal volume of the hemisphere with radius 6 cm. [2]
- (b) Find the value of r if 408 cm^3 of clay is used to make the bowl. [2]

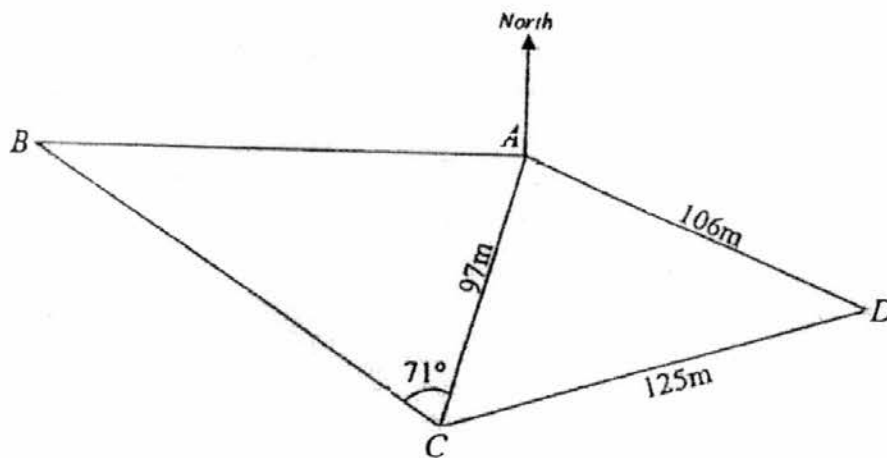


A solid pyramid with square base $ABCD$ and height OV , 6 cm, is placed in the bowl.
The points V, A, B, C and D touch the inner surface of the hemispherical bowl.

- (c) (i) Show that $AB = 6\sqrt{2}$ cm. [1]
- (ii) Calculate the volume of the pyramid. [2]

Water is poured into the bowl to fill up the space between the pyramid and the clay bowl.
The pyramid is then removed from the bowl.

- (d) Jack said that the height of the water in the bowl can be easily calculated by comparing volumes of similar solids.
Explain why he could be wrong. [1]



A, B, C and D are points on level ground.
 B is due west of A .
 $AC = 97$ m, $AD = 106$ m and $CD = 125$ m.
 $\angle BCA = 71^\circ$ and the bearing of C from B is 122° .

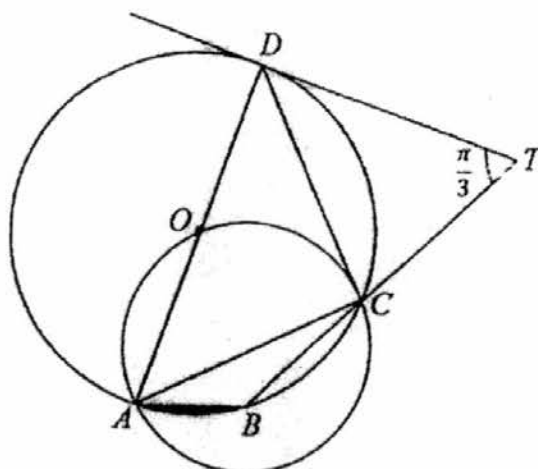
- (a) Calculate angle CAD , [2]
- (b) Find the bearing of A from D , [3]
- (c) Find the area of triangle ACD . [2]
- (d) A vertical flagpole stands at D .
 The angle of elevation of the top of the flagpole from A is 17.2° .
 Calculate the angle of elevation of the top of the flagpole at a point along AC
 and furthest from D . [3]

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

The volume of a solid is given by the equation $V - (x + 2)^3 = 6(x - 1)^2 - 14$. The table below gives some values of x and the corresponding values of V that satisfies the equation.

x (cm)	0	0.5	1	1.5	2	2.5	3	3.5
V (cm ³)	0	3.13	13	p	56	90.6	135	190

- (a) Calculate the value of p . [1]
- (b) Using a scale of 2 cm to represent 0.5 cm on the horizontal axis and 1 cm to represent 10 cm³ on the vertical axis, draw the graph of $V - (x + 2)^3 = 6(x - 1)^2 - 14$ for the values of x shown in the table. [3]
- (c) Using your graph to estimate
- (i) the volume of the solid when $x = 2.3$, [1]
 - (ii) the value of x when the volume of the solid is 150 cm³. [1]
- (d) By drawing a suitable line, find the x -coordinate of the point of the curve where the gradient of the curve is 50. [2]
- (e) This solid is melted down and made into a solid square pyramid of base area 120 cm².
- By drawing a suitable straight line on the same axes, use your graph to find the height, x , of the pyramid. [2]

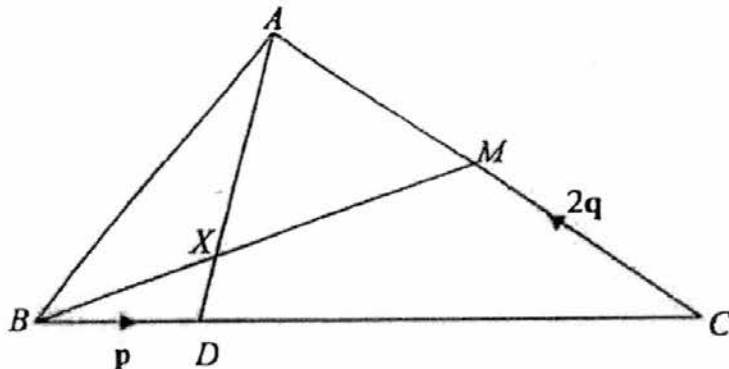


The line AD is a diameter of the larger circle $ABCD$ with centre O .
 AC is a diameter of the smaller circle OAC .
 The tangent at D meets BC produced at T .

Angle $DTC = \frac{\pi}{3}$ radians.

- (a) Show that DC is an angle bisector of angle ADT . [2]
- (b) Find, in terms of π ,
- angle DCT , [2]
 - angle AOB , [2]
- (c) Given that the radius of the larger circle $ABCD$ is 5cm, find the length of tangent DT . [3]
- (d) Calculate the area of the shaded segment AB . [2]

- 9 (a) ABC is a triangle such that $BC : BD = 4 : 1$ and $DA : DX = 5 : 1$.
 M is the midpoint of AC .
 $\overrightarrow{BD} = \mathbf{p}$ and $\overrightarrow{CM} = 2\mathbf{q}$.

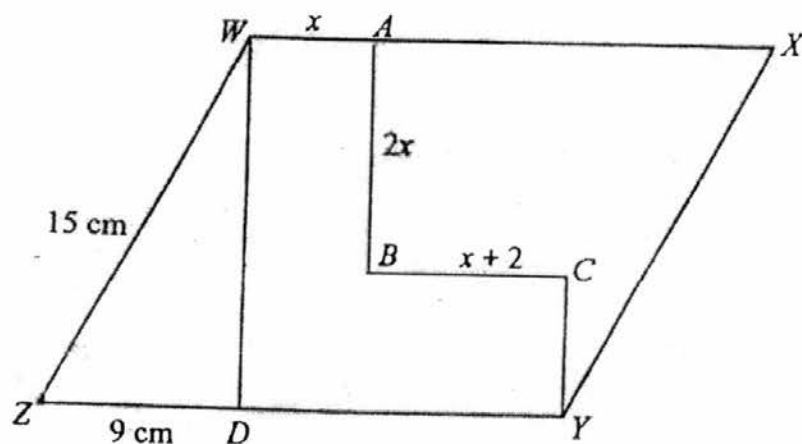


- (i) Express, as simply as possible, in terms of $\mathbf{p}$ and/or $\mathbf{q}$,
- $\overrightarrow{DA}$, [1]
 - $\overrightarrow{DX}$, [1]
 - $\overrightarrow{BM}$. [1]
- (ii) Show that $\overrightarrow{BX} = \frac{4}{5}(2\mathbf{p} + \mathbf{q})$. [1]
- (iii) Find
- $\frac{BX}{BM}$, [1]
 - $\frac{\text{Area of } \triangle ABX}{\text{Area of } \triangle AMX}$, [1]
 - $\frac{\text{Area of } \triangle ABX}{\text{Area of } \triangle ABC}$. [2]
- (b) P is the point $(3, -5)$. Another point Q is such that $\overrightarrow{PQ} = \begin{pmatrix} 1 \\ 8 \end{pmatrix}$.
- Find the exact value of $|\overrightarrow{PQ}|$. [1]
 - Given that $R(-1, m)$. Find m if P, Q and R are collinear. [2]

- 10 (a) Given that $-\frac{x-3}{4} \leq \frac{3x}{2} - 1 \leq \frac{\sqrt{448}}{2}$, list down all the possible values of x where x is a prime number. [3]

- (b) Simplify $\frac{3m^2n}{8\sqrt{m}} + \frac{15m^5}{24\sqrt{n}}$, giving your answer in the form km^bn^c where k , b and c are rational numbers. [2]

(c)



The diagram above shows a parallelogram $WXYZ$ with $WZ = 15$ cm. A vertical 'L' shape $WABCYD$ is marked inside the parallelogram such that $ZD = 9$ cm, $WA = x$ cm, $AB = 2x$ cm and $BC = (x + 2)$ cm. BC is parallel to ZY and CY is parallel to WD .

- (i) Show that $WD = 12$ cm. [1]
- (ii) Given that the area of $WABCYD$ is 60 cm^2 , write down an equation in x , and show that it simplifies to
- $$x^2 - 10x + 18 = 0. \quad [2]$$
- (iii) Solve the equation $x^2 - 10x + 18 = 0$, giving your answers correct to two decimal places. [2]
- (iv) Hence, find the area of parallelogram $WXYZ$. [2]

- 11 Read the Straits Times article on video game addiction and answer the questions that follow:

The Straits Times • Thursday 9 December 2010

Stress may turn youngsters into video game addicts

by Chua Hian Hou & Poon Chian Hui

STRESS caused by academic and family pressure could be linked to the worrying number of young Singaporeans hooked on video games, researchers said yesterday.

The study of 3,000 students aged nine to 14 was published in the Annals of the Academy of Medicine Singapore, and was carried out by researchers from NUS, the National Institute of Education (NIE), Iowa State University and Hong Kong Polytechnic University. They are carrying out further studies to find out why nearly 9 per cent of youngsters are addicted to computer gaming, and how to help them. National University of Singapore (NUS) Assistant Professor Choo Hyekyung said school and family-related stress is one factor likely to feature prominently. She declined to give further details. The new research follows the release on Tuesday of Singapore's first comprehensive study of video game addiction.

Alarmingly, 7 per cent of all students polled had shoplifted games or stolen money to pay for them. And 24 per cent of those deemed addicts cut classes to play, while more than half quarrelled with their parents over their habit. The problem has prompted the Government to take action. In August, it announced it had set aside \$10 million to fund cyber-wellness projects over the next five years.

Mr Daniel Koh of counselling practice Insights Mind Centre has this advice for parents: They must not "just cut off gaming". They also need to help their children take up another "good and fun" activity like sports to replace the habit, he said. "Many parents simply tell their children to stop playing, but to the child, the word 'stop' may mean they have to do something boring like homework... The child may take up other bad habits like smoking or drinking to kill time."

Dr Thomas Lee, head of the addiction medicine department at the Institute of Mental Health (IMH), said the danger of gaming, compared with other forms of addiction, is that a person can get far too immersed in the virtual world and, as a result, not realise he or she has a problem. "If the gaming addiction persists into adulthood, it may jeopardise the person's work, family and relationships," said Dr Lee.

■ ADDICTIVE GAMING IMPACT

Video-game addicts play 37.5 hours a week on average, compared with just 18.8 hours for those not addicted.

Behaviour exhibited in the past year	Non-addicts (%)	Addicts (%)
Has a video game system in the bedroom	61.7	70
Started arguing more with parents about games	14	52.1
Fought with parents over games	16	51.1
Hit someone or damaged something at home during argument over games	8.9	37.8
Got too little sleep	22.4	63.8
Been late for school	5.2	31.1
Skipped school to play games	4.2	24.4
Spent less time with friends or family	17.1	61.9
Skipped meals, baths, or toilet breaks to play games	19.3	52.3
Relied on friends to help with homework	9.5	40

Source: Annals Academy of Medicine

ST GRAPHICS

- (a) Give a reason why the total percentage of all the behaviour exhibited in the past year does not add up to 100% for non-addicts. [1]
- (b) Explain why it is not possible to represent the information above in a pie chart. [1]
- (c) Calculate the number of survey participants who said that they have stolen money or shoplifted games to feed their gaming habit. [1]
- (d) (i) Show that the number of young gaming addicts who participated in the survey is approximately 270. [1]
- (ii) Hence, find the approximate number of
- (a) young gaming addicts who have a video game system in the bedroom, [1]
- (b) young non-gaming addicts who have not been late for school. Give your answer to the nearest whole number. [1]
- (e) Based on the survey, the ratio of the number of non-addicts to the number of addicts who relied on friends to help with their homework is 19 : 80. Do you agree? Support your answer with mathematical reasoning. [2]

END OF PAPER

Answer Key

1. 9
2. (a) 4 (b) 1.25×10^5
3. (a) 58° (b) 110°
4. Do not agree
5. 6.25
6. (b) $y = 102, 103, 104, 105, 106, 107$
7. (a) 8 (b) Octagon
8. (a) 117 (b) 160cm^2
9. (a) $(1-x)(x-2)$ (b) $-12(x^2-2)(1+x)(1-x)$
10. 2032
11. (a) 50 (b)(i) 30
- 12.
13. (a) $3(x-4)^2 - 11$
14. (a) $\$ \frac{y(100-d)}{100}$ (b) $\$ \frac{y(100-d)}{120}$
15. (a) \$10 000 (b) 2.66
16. 720°
17. (a) 22.5 (b) 4 km/h
18. (b) $\frac{1}{2}$ (b) $\frac{11}{24}$
19. (a) $\frac{7}{8}$ (b) $\frac{5}{9}$
20. (a) 72 (b) 2 hours 56 minutes
21. (a)(i) $\begin{pmatrix} 43 \\ 49 \\ 36 \\ 57 \end{pmatrix}$ (b) $\begin{pmatrix} 1 \\ 1 \\ 1 \\ 1 \end{pmatrix}$ (c) $\begin{pmatrix} 1 & 1 & 1 & 1 \end{pmatrix} \begin{pmatrix} 4 & 5 & 1 \\ 2 & 5 & 2 \\ 3 & 4 & 1 \\ 1 & 3 & 4 \end{pmatrix} \begin{pmatrix} 2 \\ 5 \\ 10 \end{pmatrix}$
22. 2.27
23. (a)(i) $\frac{8}{15}$ (ii) $-\frac{15}{17}$ (b) 9.43
24. (a) $(0, 1)$ (b) $(-1, 3\frac{2}{3})$ and $(-1, 4\frac{1}{2})$
25. (a)(i) 22° (ii) 68°
26. (a) 15

ANSWER KEY

1(a)(i)	158.1 cm	5(d)	The water in the hemispherical bowl is not of the shape of a hemisphere
1(a)(ii)	7.51 cm	6(a)	75.9°
1(a)(iii)	Max value may not be 175cm	6(b)	297.1°
1(b)	The girls in school Y (mean 161.6 cm) are taller than the girls in school X (mean 158.1 cm) The heights of girls in school Y are more consistent (SD = 5.06 cm) than the height of girls in school X (SD = 7.51 cm)	6(c)	4990 m ²
2(a)	$8p + 2q = 116.60$ $4p + 3q = 90.10$	6(d)	14.7°
2(b)	$p = 10.60$; $q = 15.90$	7(a)	$30\frac{3}{8}$ or 30.375
2(c)	\$650.31	7(c)(i)	76 cm (± 0.1)
3(a)	44 ; 64	7(c)(ii)	3.15 (± 0.05)
3(b)	Perfect squares	7(d)	$x = 1.8 (\pm 0.1)$
3(c)	89 is not a perfect square	7(e)	$x \approx 2.72 \text{ cm } (\pm 0.1)$
3(d)	$(n + 4)^2$	8(b)(i)	$\frac{5\pi}{12}$ radians
3(e)(i)	17	8(b)(ii)	$\frac{\pi}{6}$ radians
3(e)(ii)	1445	8(c)	7.89 cm
4(a)(i)	$y = \sqrt{\frac{72}{h^2 - 14}}$	8(d)	0.295 cm ²
4(a)(ii)	$h^2 > 14$	9(a)(i)(a)	$3p + 4q$
4(b)	$x = -13.5$	9(a)(i)(b)	$\frac{1}{5} (3p + 4q)$
4(c)	14	9(a)(i)(c)	$2(2p + q)$
5(a)	452 cm ³ or $144\pi \text{ cm}^3$	9(a)(ii)	$\frac{2}{5}$
5(b)	7.43	9(a)(iii)(a)	$\frac{2}{3}$
5(c)(ii)	144 cm ²	9(a)(iii)(b)	$\frac{2}{5}$
		9(a)(iii)(c)	$\frac{1}{5}$

9(b)(i)	$\sqrt{65}$ units	
9(b)(ii)	- 37	
10(a)	2, 3, 5, 7	
10(b)	$\frac{3}{5}n^{\frac{1}{2}}m^{-\frac{1}{2}}$	
10(c)(iii)	2.35, 7.65	
10(c)(iv)	189 cm ²	
11(a)	The 3000 participants of the survey were allowed to opt in more than one exhibited behaviour in the survey questions.	
11(b)	The total percentage for either "non-addicts" or "addicts" does not add up to 100%. Pie chart is not suitable since it compares the sizes of these parts to the whole (100%).	
11(c)	210	
11(d)(ii)(a)	189	
11(d)(ii)(b)	2588	
11(e)	1729 : 720 instead of 19 : 80. NO	