TRIAL SCHOOL CERTIFICATE

2001

MATHEMATICS

INTERMEDIATE

Examiner : Sami El Hosri

The examination is divided into five sections, covering:

GEOMETRY
NUMBER
MEASUREMENT AND TRIGONOMETRY
CHANCE AND DATA
ALGEBRA

Time allowed – Two hours
(Plus 5 minutes reading)

- A single answer sheet is provided for the part A (multiple choice) questions in all five sections.
- Part B answers should be written in the spaces provided.
- Approved calculators may be used.
- Each of the five sections is worth 17 marks.
- It is recommended that about twenty-four minutes should be spent on each section.

INTERMEDIATE 2001 - ANSWER SHEET

FOR ALL PARTS A OF EACH OF THE FIVE SECTIONS

INSTRUCTIONS:

- CROSS THE BOX THAT INDICATES THE CORRECT ANSWER

GEOMETRY

1	A	B	C	D
2	A	B	C	D
3	A	B	C	D
4	A	B	C	D

NUMBER

1	A	B	C	D
2	A	B	C	D
3	A	B	C	D
4	A	B	C	D

MEASUREMENT

1	A	B	C	D
2	A	B	C	D
3	A	B	C	D
4	A	B	C	D

CHANCE & DATA

1	A	B	C	D
2	A	B	C	D
3	A	B	C	D
4	A	B	C	D

ALGEBRA

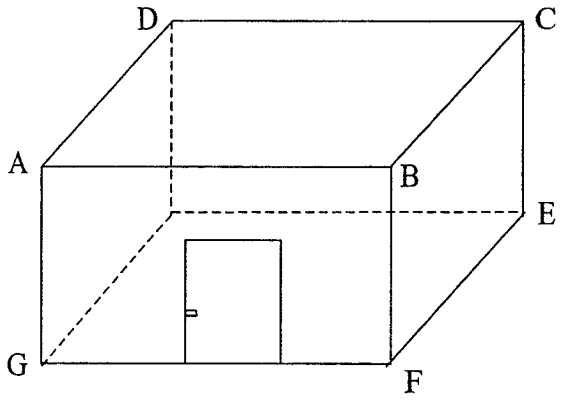
1	A	B	C	D
2	A	B	C	D
3	A	B	C	D
4	A	B	C	D

TRIAL SCHOOL CERTIFICATE - 2001

INTERMEDIATE - GEOMETRY

PART A

1. John made the following statements about the edge lines of his classroom, which is shown in the diagram below:



I) AG is parallel to CE.

II) AD is perpendicular to AG.

John was correct in:

A) I only B) II only C) Both I and II D) Neither I nor II.

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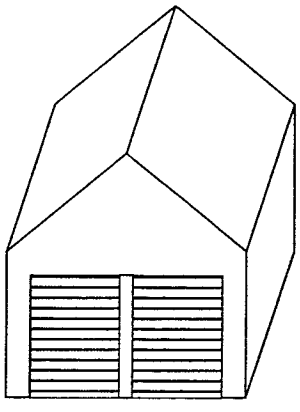
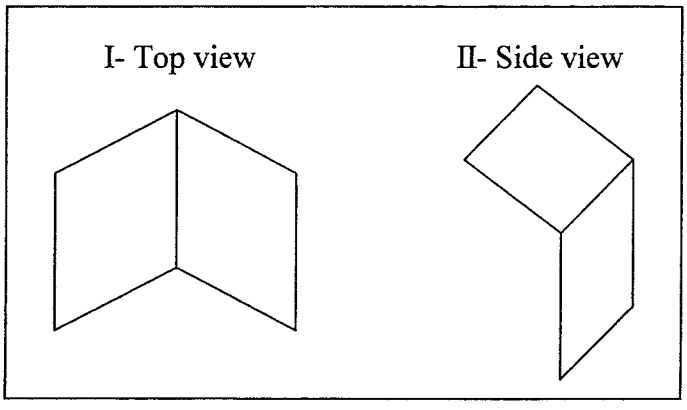
2. Rachel tried to draw the top and side views of her double garage as shown in the diagram below.



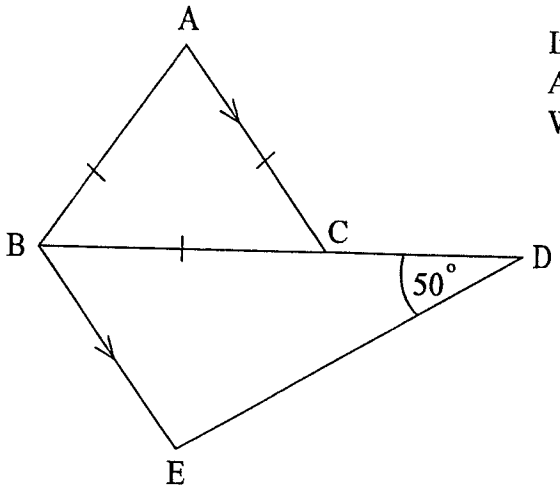
RACHEL'S DRAWINGS



She was correct in:

A) I only B) II only C) Both I and II D) Neither I nor II.

3.



NOT TO SCALE

In the diagram triangle ABC is equilateral, AC is parallel to BE and $\angle BDE = 50°$. What is the size of $\angle BED$?

A) 80° B) 70°

C) 50° D) 60°

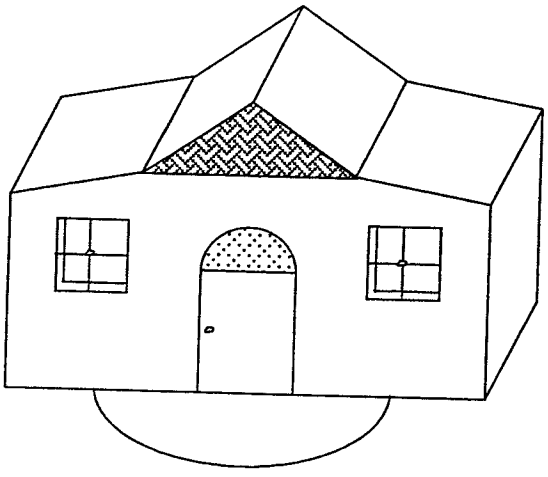
---

4. Rachel was asked to draw a quadrilateral in which the diagonals are equal and bisect each other. Which of the following should she draw ?

A) rectangle B) rhombus C) parallelogram D) trapezium

PART B

5. The diagram below shows Tania's house. Draw a plan view (i.e. top view) of the house.



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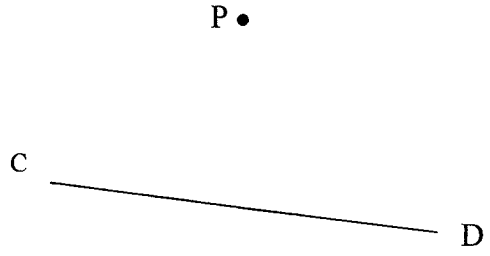
6. The point P represents Peter's new factory which is built close to a freeway CD. A perpendicular lane is to be constructed from P to CD. Construct accurately a line to represent the lane.



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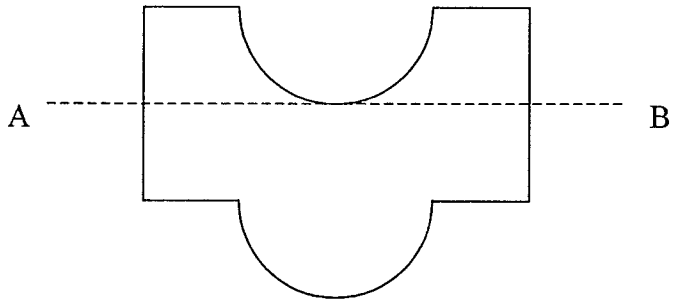
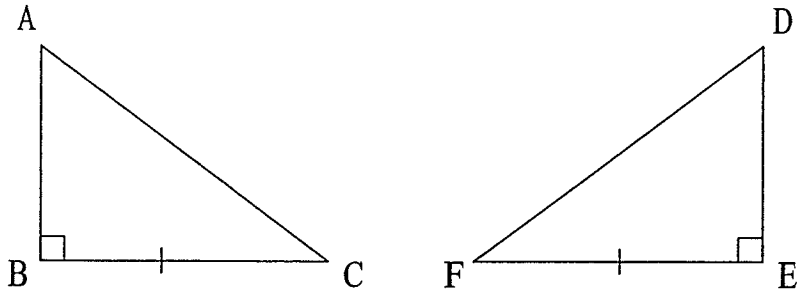
7. If AB is the axis of symmetry of the figure below, complete the figure.



8.



Given that BC = EF and that $\angle ABC = \angle DEF = 90°$,
write one more condition necessary to make ΔABC congruent to ΔDEF.

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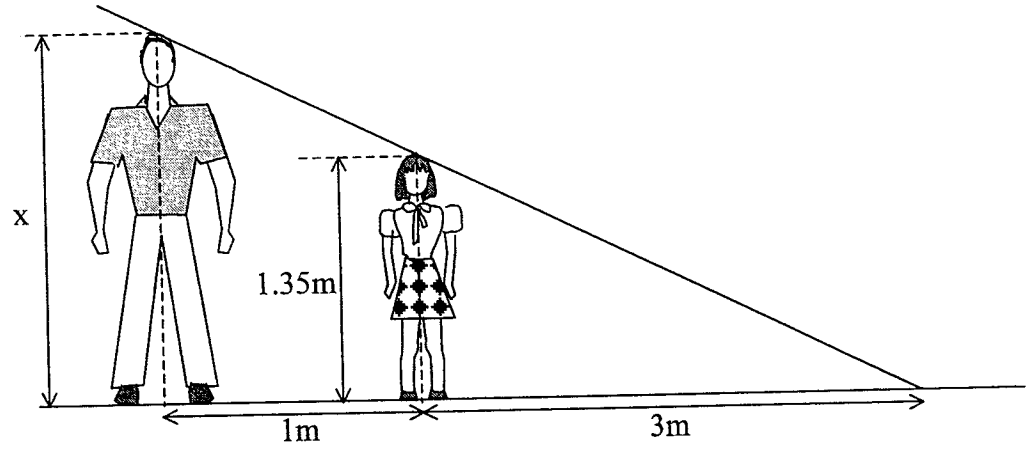
9. The diagram shows Vanessa and her father standing and their shadows projected on the ground.

Use the information shown on the diagram to find the height x in metres of Vanessa's father.



NOT TO SCALE

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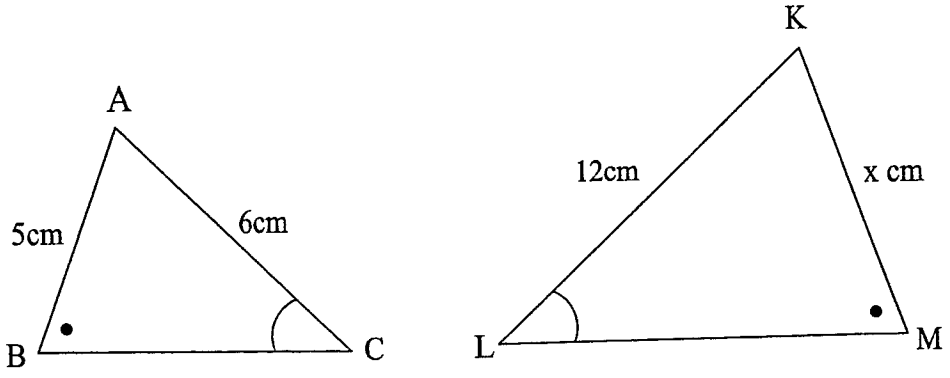
10. In the diagram below, triangle ABC is similar to triangle KLM.
Find the value of x.



NOT TO SCALE

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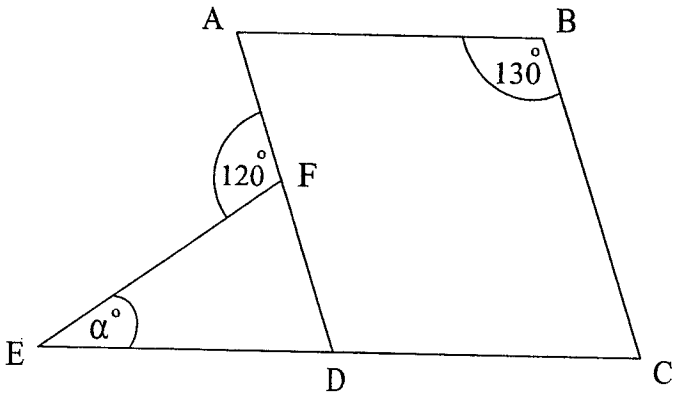
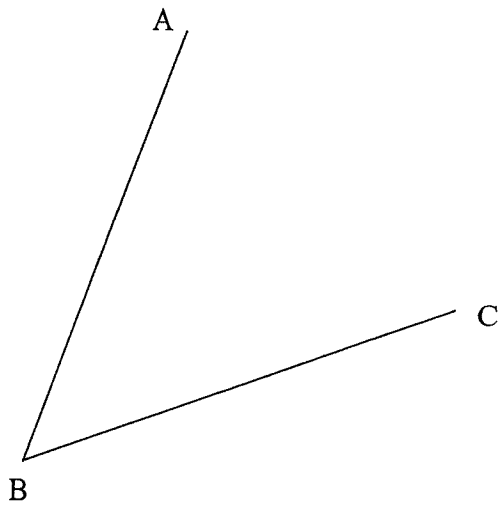
11. The diagram shows the parallelogram ABCD with $\angle ABC = 130°$ and $\angle EFA = 120°$. Find the value of α. (Give reasons).



NOT TO SCALE

QUESTION 12



i) Measure angle ABC to the nearest degree.

ii) ABCD is a quadrilateral such that AD = AB and ∠DAB = 130°. Use your geometrical instruments to complete the quadrilateral.

iii) What type of quadrilateral is ABCD? Give reasons.

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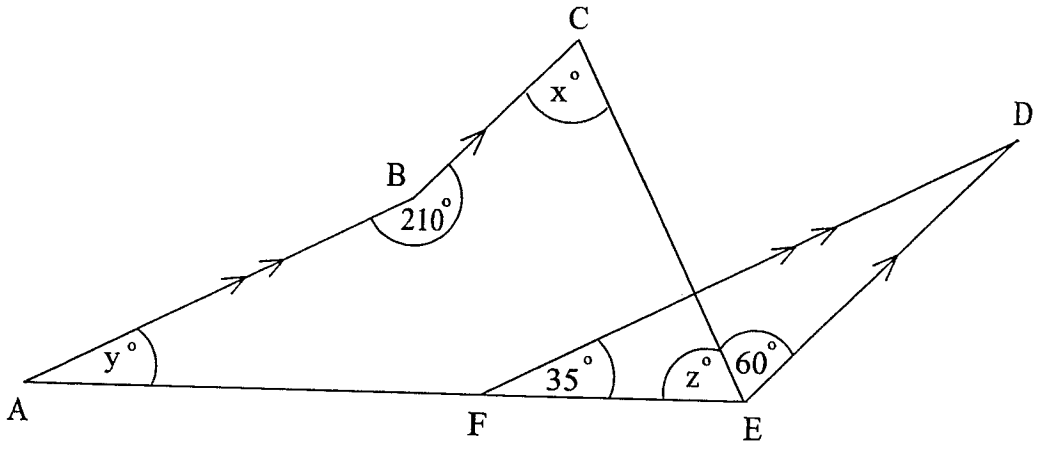
.....

.....

QUESTION 13



NOT TO SCALE

In the diagram above, AB is parallel to FD and BC is parallel to ED.
$\angle CED = 60°$, $\angle DFE = 35°$ and $\angle ABC = 210°$.

a) Find the value of x. (Give reasons).

.....

.....

b) Find the value of y. (Give reasons).

.....

.....

c) Find the value of z. (Give reasons).

.....

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INTERMEDIATE - NUMBER

PART A

1. 'Veggies Specialists' are selling tomatoes in 4 different sized bags. Which size offers the best value?

   A) 2kg for $6.30

   B) 3kg for $9.15

   C) 4kg for $10

   D) 5kg for $13

---

2. General Street High School has 140 tennis and basket balls altogether. The ratio of the number of tennis balls to the number of basketballs is 7:3.

   How many basketballs does the school have?

   A) 42 B) 60 C) 98 D) 20

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3. Anthony bought a book for $30. He noticed that he still had 60 % of his original amount of money. How much did he have originally?

   A) $100 B) $50 C) $48 D) $75

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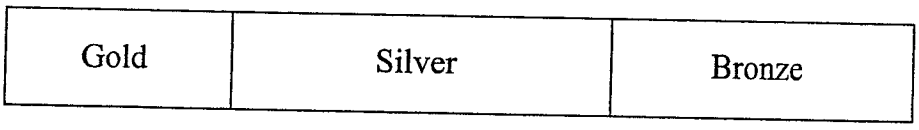
4. At the Olympic Games, a country's medal tally was 48 medals. The bar graph below shows the proportion of gold, silver and bronze medals won.



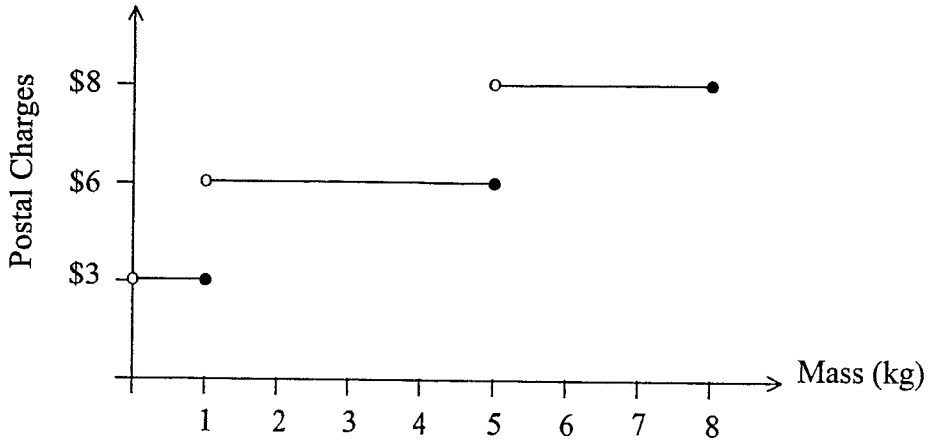
   How many more silver than gold medals did this country win ?

   A) 12 B) 2 C) 8 D) 4

PART B

5. The table below shows the postal charges for parcels within Green Island. Peter sends two parcels which weigh 2kg and 5kg to his friend who also lives in Green Island.

How much does he pay for postage?

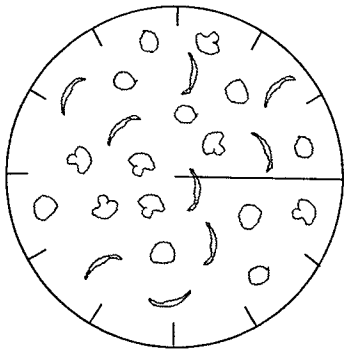


6. The computer training Graphic Specialists' charges are as shown in this table.

First 6 hours	$120 per hour
Each additional hour after 6 hours	$80 per hour

Samantha needed 8 hours of training. How much did she pay for this training?

7. Veronica and Mel are to share this pizza in the ratio 1:2. A cut is already shown. Draw a possible line to indicate a second cut which shows their shares.



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8. Given that $I = \frac{PRT}{100}$, calculate the interest that Vanessa will earn by investing \$8000 at a simple interest rate of 8% p.a. for 3 years.

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9. The points that can be scored in a computer game are:

First 5 levels	200 points per level
level 6 and beyond	300 points per level
• Bonus 5000 points for successful completion of level 10	

Edward is playing this computer game and he has just successfully completed level 10. How many points has he scored so far?

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10 Jason's weekly wage is $750. He decides to take his four weeks annual holiday. Find his holiday pay which consists of his normal pay for the four weeks plus 17.5% holiday loading.

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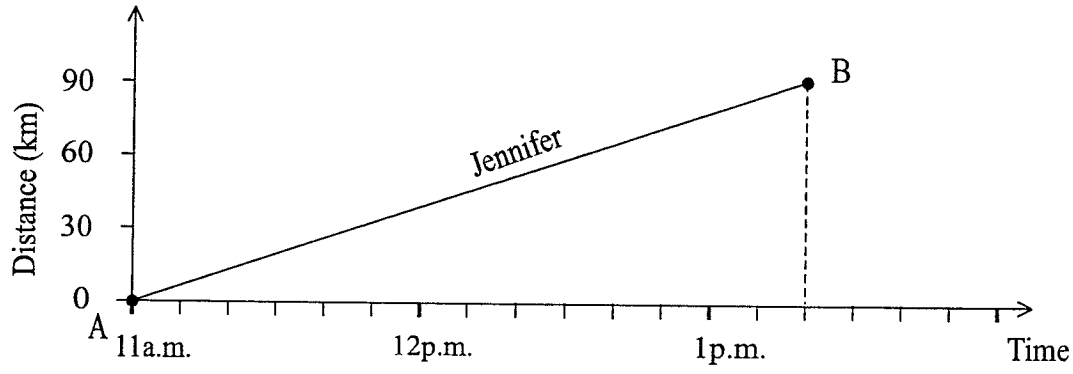
11. Jennifer left town A and travelled to town B as shown in the graph below.



Anthony left town A some time after Jennifer and travelled constantly at twice her speed in order to arrive at town B at the same time.

On the graph, draw a line to represent Anthony's journey.

QUESTION 12

Vanessa works as a computer engineer and receives a yearly salary of $90 000. Her tax deductions amounts to $10 000.

a) Find her taxable income.

b) Using the tax table below, calculate the amount of tax she should pay for the year.

New Scale Taxable Income	Tax
$0 - $6000	NIL
$6001 - $20 000	NIL plus 17c for each $ in excess of $6000
$20 001 - $50 000	$2 380 plus 30c for each $ in excess of $20 000
$50 001 - $60 000	$11 380 plus 42c for each $ in excess of $50 000
$60 001 and over	$15 580 plus 47c for each $ in excess of $60 000

c) Given that during the year tax instalments of $25 400 were deducted from her pay, how much will her refund or further tax payment be at the end of the year?

QUESTION 13

Jessica won the 5 million dollars lotto. She bought 1.5 million shares in a large computer company at $2 each, and invested the remaining amount in a bank at 10% p.a. simple interest.

a) Find the amount which will be in the bank account at the end of the first year.

b) The share price had increased by 15% by the end of the first year. Find the value of the shares at that time.

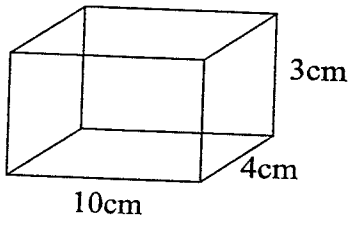
c) Find her total percentage profit from both investments at the end of the first year.

INTERMEDIATE – MEASUREMENT

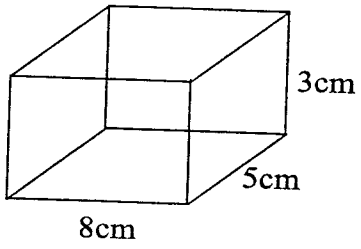
PART A

1. The diagram below shows four chocolate blocks. Samantha chose the block which has the largest volume. Which one of them did she choose?

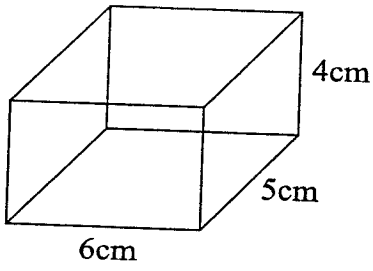
A)



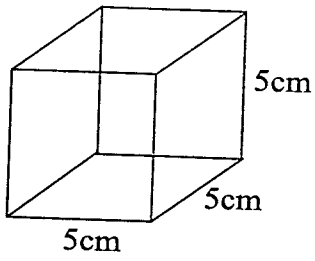
B)



C)



D)



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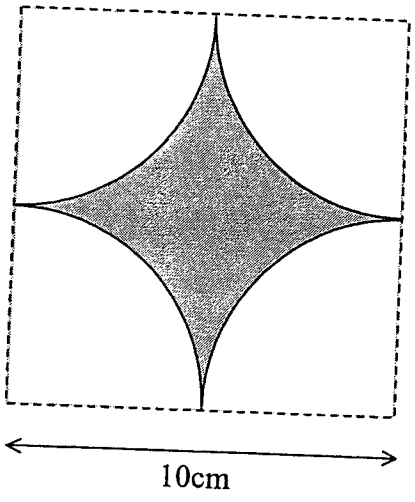
2. The shaded region is formed by removing 4 identical quarter-circles from a square of side 10cm.

The perimeter of the shaded region to the nearest centimetre is:



A) 16cm

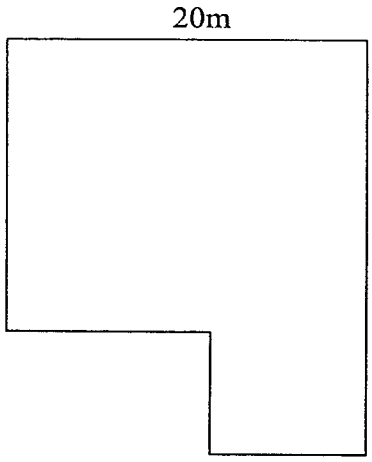
B) 31cm

C) 63cm

D) 126cm

---

3. The diagram represents Peter's land which is to be fenced. How long will the fence be?



NOT TO SCALE

A) 60m

B) 120m

C) 140m

D) More information needed.

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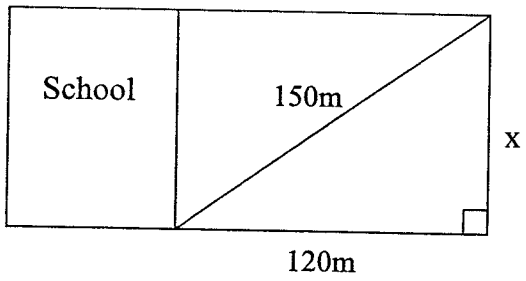
4. Sam is a teacher. He is to write 80 yearly reports for his students. On average, it takes him 5 minutes to write each report and he wants to have a 10 minutes break after each 20 reports completed.

If he starts at 4p.m, at what time of the day does he finish?

A) 10:40p.m B) 10:50p.m C) 11:10p.m D) 11:20p.m

PART B

5. The rectangle below represents a school playground. Use Pythagoras's theorem to find x, the width of the playground.



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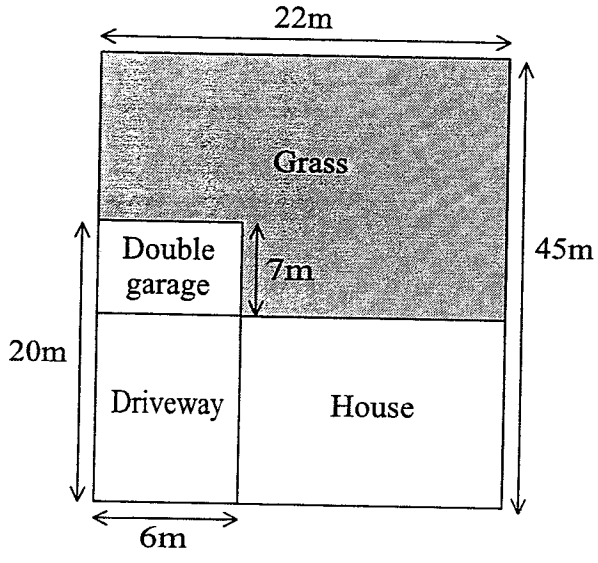
6. The diagram represents Rebecca's house. She wants to mow the grass in her backyard. Find the area she will mow.



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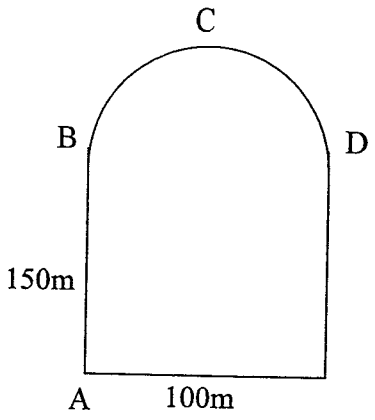
7. The diagram below represents a park which consists of a rectangle and a semicircle. Tom wants to run along the outside of the park starting from A and finishing at D, passing by B and C. What distance does he run?



NOT TO SCALE

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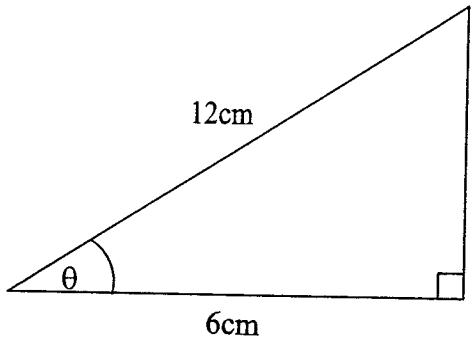
8. From the diagram, find the value of θ.



NOT TO SCALE

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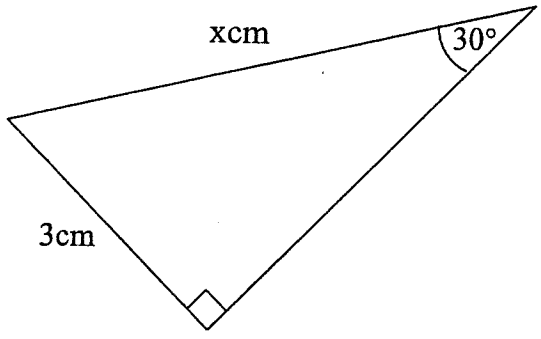
9. From the diagram, find the value of x.



NOT TO SCALE

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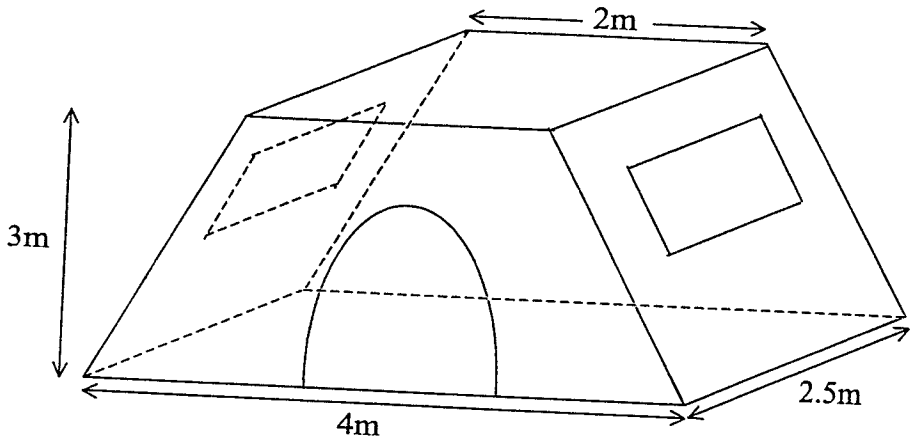
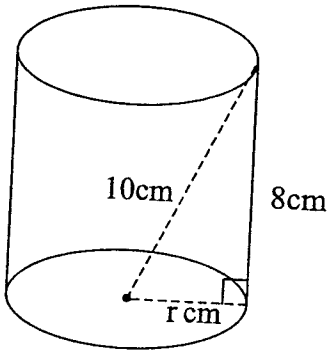
10. The diagram below shows a tent which is in shape of a trapezoidal prism. Find the volume inside the tent.

Area of a trapezium = $\frac{h}{2}(a+b)$



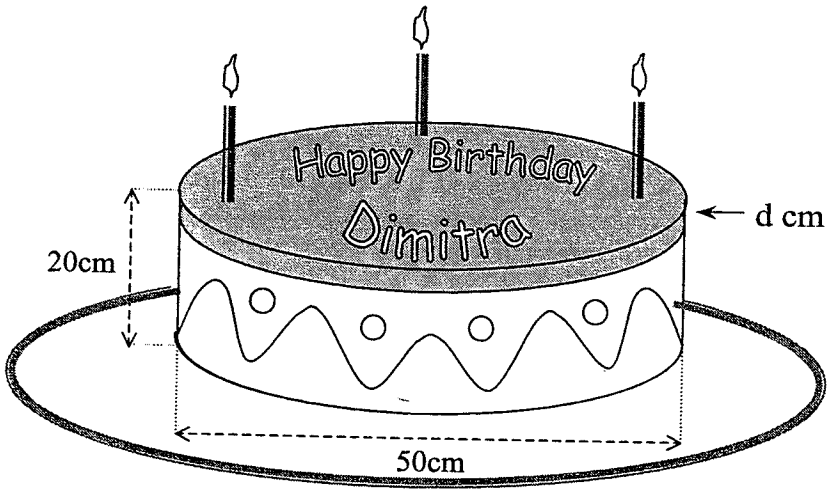
11.



Find the surface area of the closed cylinder correct to the nearest square centimetre.

QUESTION 12 (3 marks)

The diagram below shows Dimitra's birthday cake which is in a shape of a cylinder.

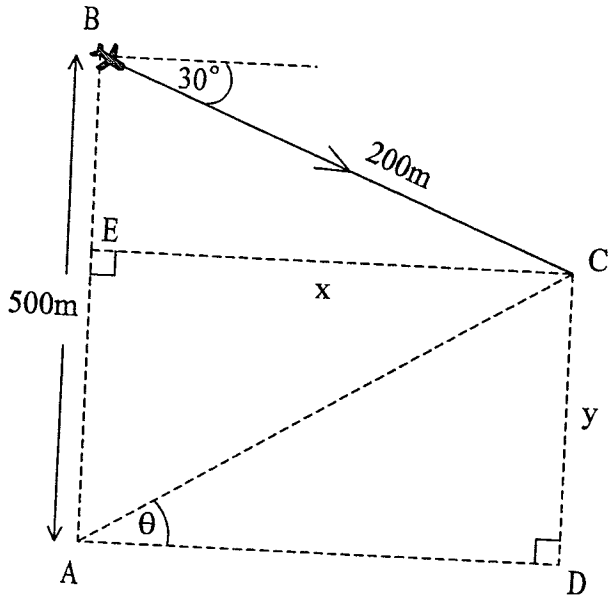


a) Find the volume of the cake to the nearest cubic centimetre.

b) The top of her cake has a chocolate layer of volume 7854 cm^3. Find the depth d of the layer correct to the nearest cm.

c) The cake can be cut into 8 equal pieces, each having a mass of 75g. What will be the mass of each piece if the cake is cut into 12 equal pieces?

QUESTION 13 (3 marks)



NOT TO SCALE

Alex's plane is at the point B 500m above a ground radar station at A.
The plane is descending towards C at an angle of 30° below the horizontal.

a) Find the horizontal distance x travelled when the plane reaches C.
Answer correct to the nearest centimetre.

b) Find the height y of the plane at point C.

c) Find the angle of elevation θ of the aircraft at C from A.
Answer correct to the nearest minute.

INTERMEDIATE – CHANCE & DATA

PART A

1. What is the median of the following set of scores?

   8, 2, 4, 2, 6, 6.

   A) 2 B) 3 C) 4 D) 5

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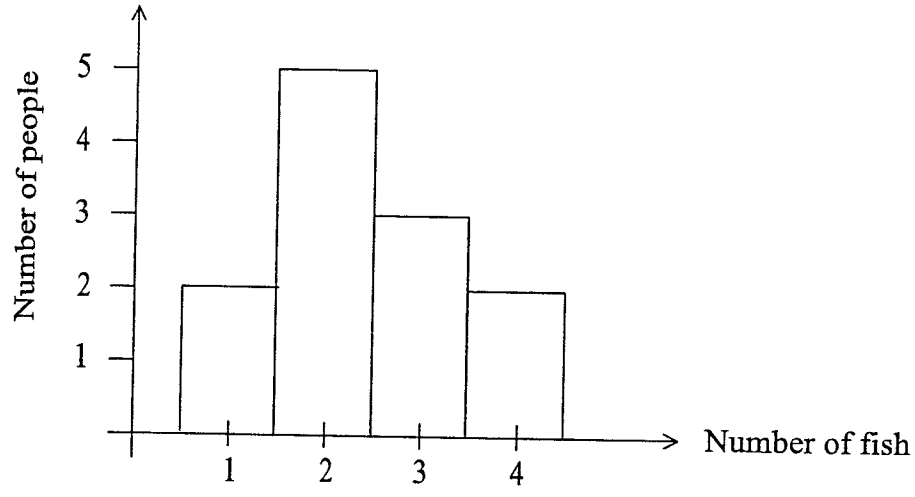
2. A group of friends went on a four hour fishing trip. The frequency histogram shows the number of fish caught per person.



   What is the total number of fish caught by the group?

   A) 29 B) 12 C) 34 D) 10

---

3. A box contains 5 green and 4 yellow marbles. Peter chooses one marble at random from the box. What is the probability that he selects a yellow marble?

   A) $\frac{4}{5}$ B) $\frac{1}{4}$ C) $\frac{1}{9}$ D) $\frac{4}{9}$

---

4. The names of all 20 students in a class are written on individual cards and placed in a hat. Each member selects a card at random and keeps it to buy a kris kringle gift for the student whose name is on it.
If a student draws his or her own name the card is replaced and another is drawn.

Samantha selected John's name at random and John has the second turn. What is the probability that he will randomly select Samantha's name?

A) $\frac{1}{20}$ B) $\frac{1}{19}$ C) $\frac{1}{18}$ D) $\frac{1}{10}$

---

5. The stem and leaf plot shows the weight of a group of children.

2	5 6 7 8
3	0 2 5 7 8

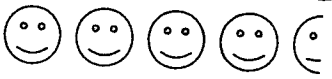
Find the median weight of the members of this group.

---

6. In the following picture diagram, the number of people living in three suburbs are as shown.

Greentown : 

Funtown: 

Belrose: 

Key:  = 10 000 people.

How many more people live in Funtown than in Belrose?

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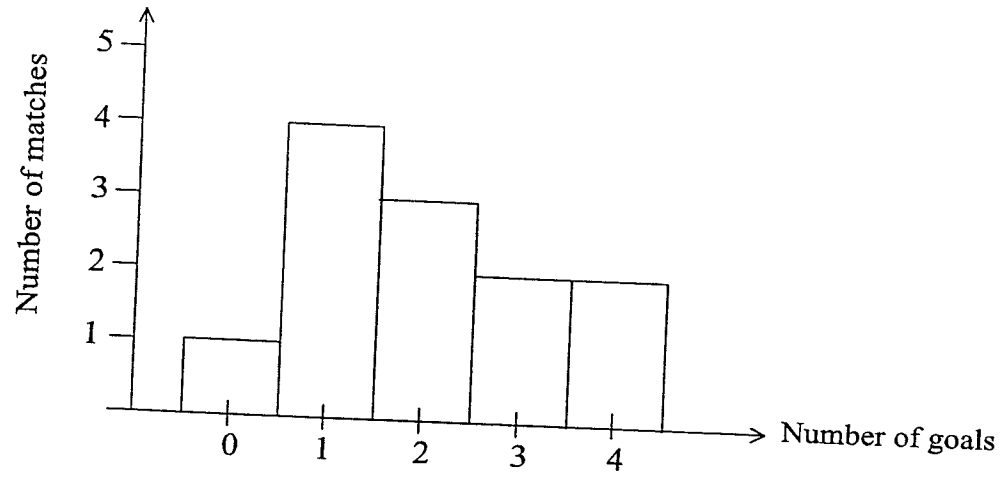
7. The histogram graph below shows the number of goals scored by the Dazzlers in a series of soccer matches.



Find the median number of goals scored in this series.

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8. Adam played seven games of ten pin bowling. The missing ☐ in the frequency table below represents one of his scores.

Score	Frequency
132	2
134	1
☐	1
140	3

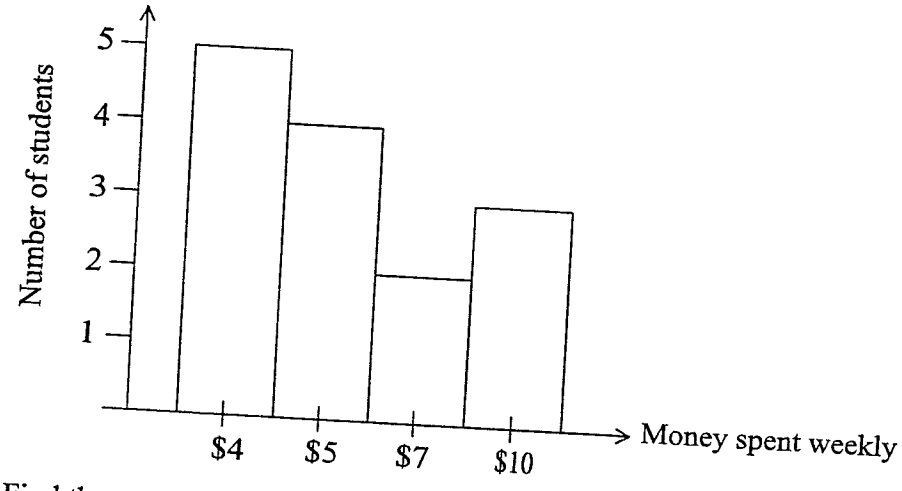
Given that the mode is four more than the median, find Adam's missing score.

---

9. The square $\square$ represents a missing digit in the stem and leaf plot. Given that the median is equal to the range, what does $\square$ represent?

3	2
5	5 8
6	$\square$ 9
8	7
9	5

10. The frequency histogram below represents the amount of pocket money spent weekly by a group of year four students in their school canteen.



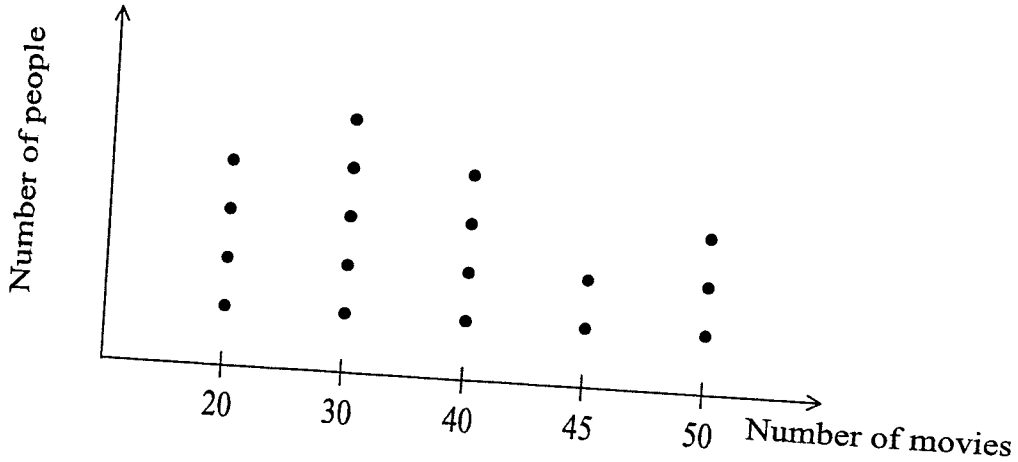
Find the average weekly amount of money spent by the members of this group.

11. In Sam's Chess Club there are more than 11 students. All are born in the same year but none of them in the same month.

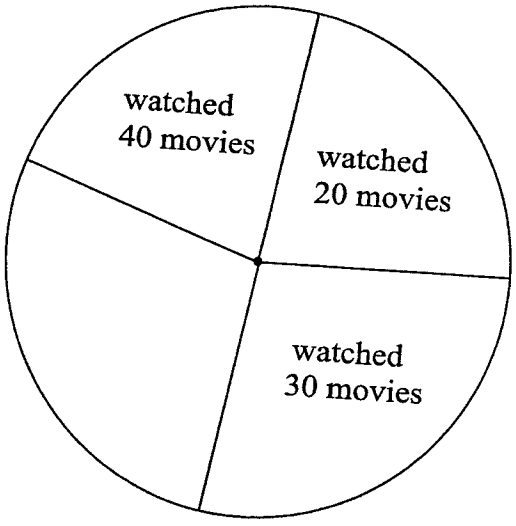
If one of them is chosen at random, what is the probability that the person chosen is born in a month that starts with 'J'?

QUESTION 12 (3 marks)

The dot plot below show the number of movies watched in a particular year by a group of 18 people.



a) Jane starts to graph the above data in a sector graph according to the number of people. Complete the sector graph.



b) Find the mean number of movies watched during the year by the members of the group.

.....

.....

c) If one person is chosen at random from the group, what is the probability that the number of movies watched by this person is more than the median of the group?

.....

.....

QUESTION 13

The temperatures in Sydney and Cairns, over the first 2 weeks in January, were recorded for comparison in the stem and leaf plot below.

SYDNEY

2	4 5 5 6 6 7 7 7 8
3	0 1 1 2 □

CAIRNS

2	8 8 9 9
3	0 3 3 3 4 7 8
4	0 1 3

During these two weeks:

a) What is the difference between the modal temperatures of Sydney and Cairns?

.....

.....

b) What is the mean temperature in Cairns?

.....

.....

c) If the range of temperatures in Cairns is 6 more than the range of temperatures in Sydney, find the missing temperature in the stem and leaf plot for SYDNEY.

.....

.....

INTERMEDIATE – ALGEBRA

PART A

1. Amanda made the following statements:

I) $x \times x = x^2$ II) $x^2 + x^2 = 2x^4$

In which of her statements is she correct?

A) I) only B) II) only

C) Both I) and II) D) Neither I) nor II)

---

2. Solve : $-3x \leq 12$

A) $x \leq -4$ B) $x \geq -4$ C) $x \leq -\frac{1}{4}$ D) $x \geq 4$

---

3. Eddy packed T tennis balls in N boxes each containing 4 balls. Which of the following is the correct formula for his work?

A) $T = 4N$ B) $N = 4T$ C) $T = N + 4$ D) $N = T + 4$

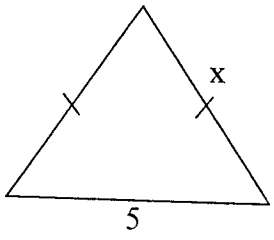
---

4. What is the gradient of the straight line whose equation is $x = 2y$?

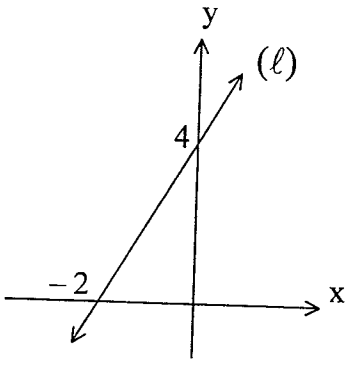
A) -2 B) 2 C) $-\frac{1}{2}$ D) $\frac{1}{2}$

PART B

5. A piece of wire is made in the shape of an isosceles triangle as shown below. Find the length of the wire in terms of x.



6.



Find the equation of line (ℓ).

NOT TO SCALE

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7. The profit P in dollars that Sophia made from selling roses on Valentine's Day can be calculated using the formula: $P = 5R - 25$, where R is the number of roses sold.

What was Sophia's profit on that day if she sold 75 roses?

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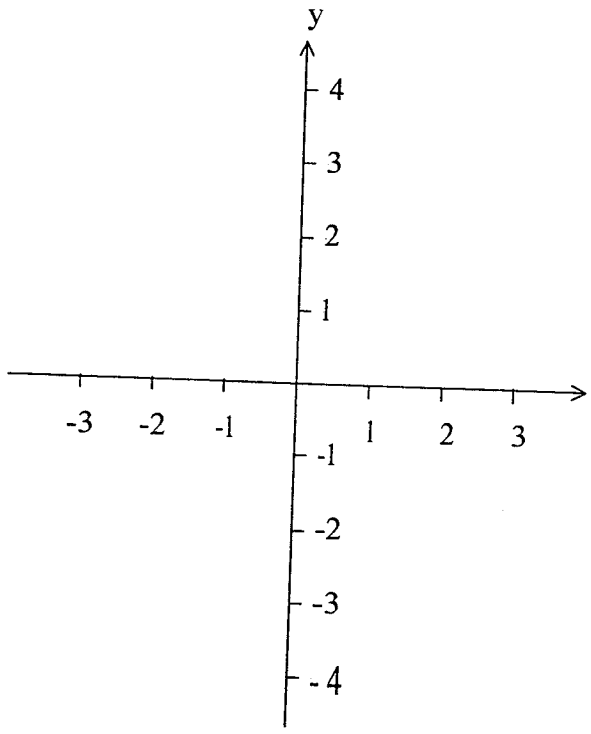
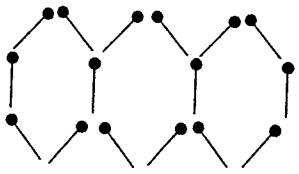
8. Draw on the number plane below the line $y = 2 - 2x$.



9. Julia has 101 matches which she is using to make this pattern.

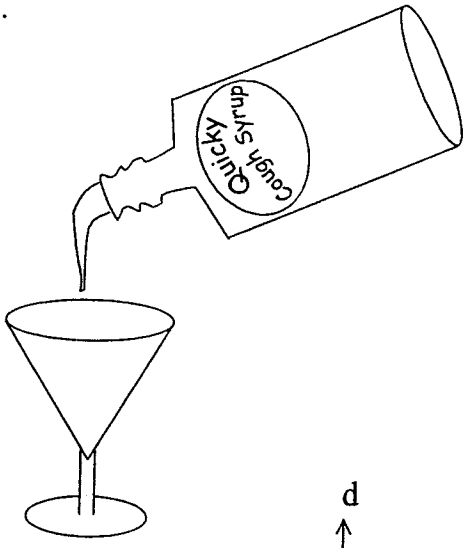


She wants to continue forming as many hexagons as possible.

How many hexagons can Julia make using the 101 matches?

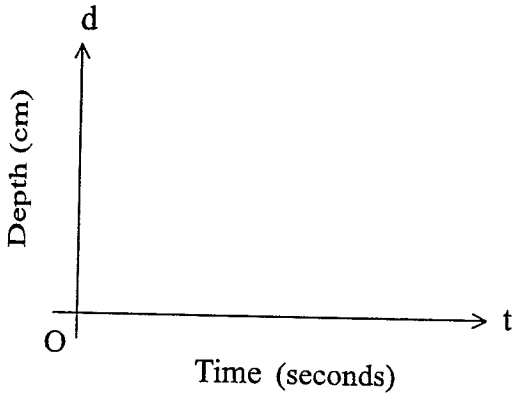
10. Simplify : $\frac{3x}{4} - \frac{5x}{12}$

11.



The diagram shows a measurement cup being filled with a cough syrup.

On the axes provided, sketch a graph that represents the changing depth of the medicine as the cup is being filled.



QUESTION 12 (3 marks)

"Car Rental Experts" use the formula $C = 50 + 80n$ to calculate the cost \$C of renting a car for n days.

a) Ronald and James rent a car from the Car Rental Experts for 5 days and 7 days respectively. How much more than Ronald will James pay?

b) If Veronica rented a car and paid \$1010, for how many days did she rent the car?

c) The company manager wants to increase the charge per day to \$90 and the base fee to \$60. Write a formula for the new cost C of renting a car from the Car Rental Experts.

QUESTION 13 (3 marks)

Jessica is playing a computer game where the aim of the game is to collect keys in order to advance to the next level.

In level 1, she collects 6 keys. In level 2, she collects 14 keys and so on. She realises that the number of keys in each level is found by the formula $K = 8L - 2$, where K is the number of keys and L is the level number.

a) How many more keys can she collect in level 10 than in level 9?

b) Jessica finds 94 keys in a certain level. What level is it?

c) Jessica finds $(8p - 2)$ keys in level p. How many more keys can she find in level $(2p + 1)$?

Formulae

Simple interest = PRT where $R = \frac{r}{100}$

Amount (compound interest) = $P(1+R)^n$ where $R = \frac{r}{100}$

Circumference of a circle = πd

Area of a circle = πr^2

Surface area of a cylinder = $2\pi r^2 + 2\pi rh$

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

Curved surface area of cone = πrs where s = slant height

Volume of prism = Ah

Volume of a pyramid or a cone = $\frac{1}{3}Ah$

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

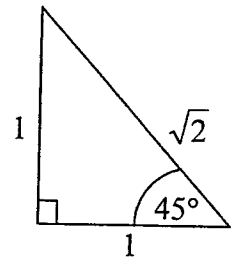
Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

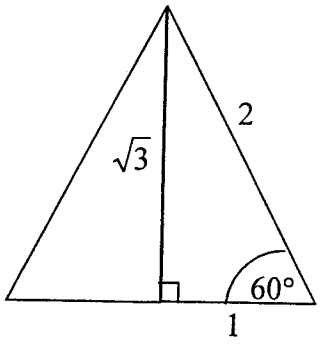
Cosine rule: $a^2 = b^2 + c^2 - 2bc\cos A$, $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$

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

Quadratic formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Exact value triangles:





TRIAL SCHOOL CERTIFICATE 2001 SOLUTIONS

MATHEMATICS - INTERMEDIATE

GEOMETRY

1) (C) AG & CE are both vertical lines. $\therefore$ AG $\parallel$ CE

AG is a vertical line. AD is a horizontal line. $\therefore$ AD $\perp$ AG

2) (D)

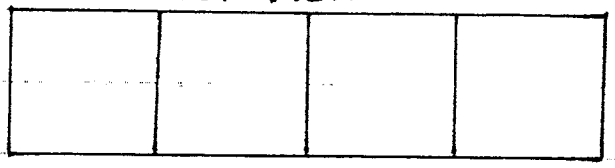
3) (B) $\angle ACB = 60°$ (angle in equilateral ΔABC)

$\therefore \angle CBE = 60°$ (alternate angles, AC $\parallel$ BE)

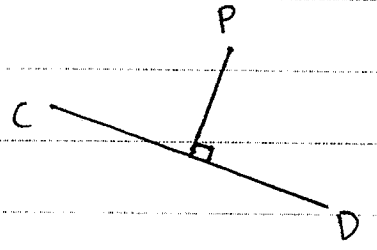
$\therefore \angle BED = 70°$ (angle sum of ΔBED).

4) (A)

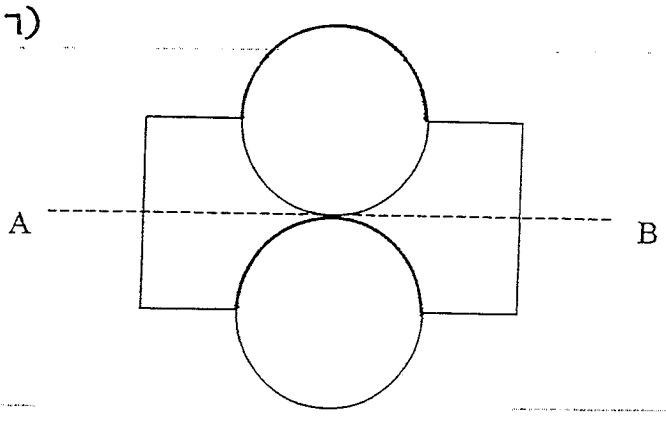
5)



6)



7)



8) Any of the following is correct:

(i) AB = DE (SAS)

(ii) AC = FD (RHS)

(iii) $\angle BAC = \angle FDE$ (ASA)

(iv) $\angle ACB = \angle DFE$ (ASA)

9) Using ratio of sides of similar triangles: $\frac{x}{1.35} = \frac{4}{3}$ $\therefore x = 1.8m$

10) Using ratio of sides of similar triangles: $\frac{x}{5} = \frac{12}{6}$ $\therefore x = 10cm$

11) $\angle ADC = 130°$ (opposite angles in parallelogram ABCD are equal).

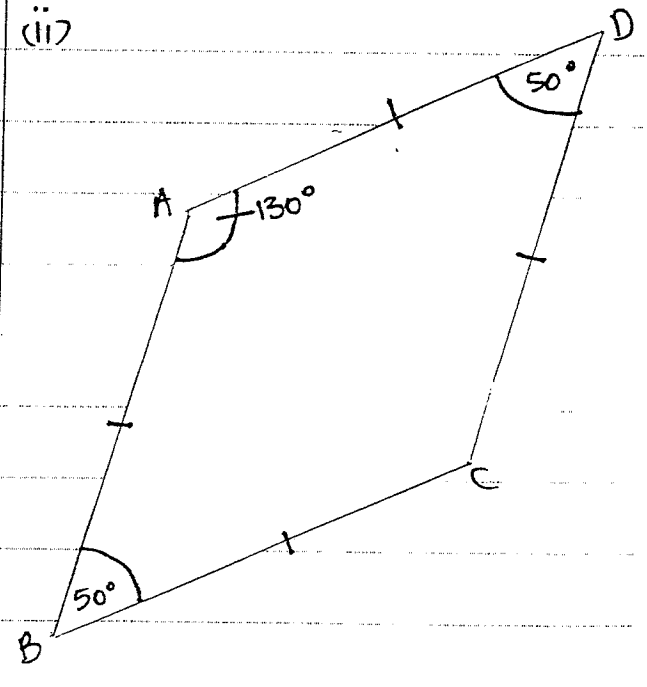
$\therefore \angle FDE = 50°$ (supplementary angles).

$\angle EFD = 60°$ (supplementary angles).

$\therefore \alpha = 70°$ (angle sum of ΔFED).

12) (i) $\angle ABC = 50°$

(ii)



(b) Value of shares = 3000000×1.15

$= \$3450000$

(c) Total profit = $2200000 + 3450000 - 5000000 = \$650000$

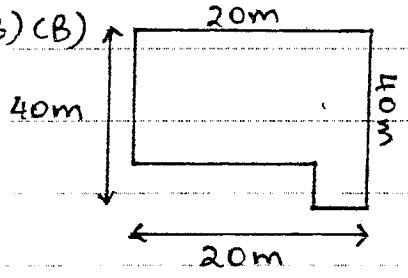
Percentage profit = $\frac{650000}{5000000} \times 100 = 13\%$

MEASUREMENT

1) (D) Volume A = $3 \times 4 \times 10 = 120 cm^3$
Volume B = $3 \times 5 \times 8 = 120 cm^3$
Volume C = $6 \times 5 \times 4 = 120 cm^3$
Volume D = $5 \times 5 \times 5 = 125 cm^3$

2) (B) Perimeter = $\pi d = \pi \times 10 \doteq 31 cm$

3) (B)



∴ Length = 20 + 40 + 20 + 40 = 120m

4) (C) $80 \times 5 + 10 \times 3 = 430$ mins

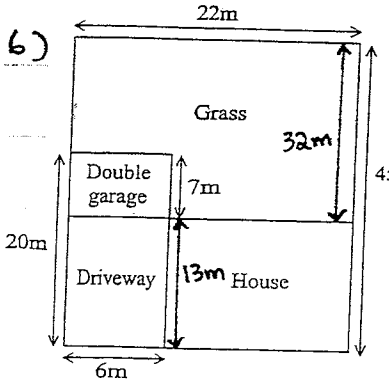
$= 7$hrs 10 mins

∴ He will finish at 11:10pm.

5) Using Pythagoras' Theorem,

$x = \sqrt{150^2 - 120^2} = 90m$

6)



Area mowed =

$32 \times 22 - 6 \times 7$

$= 662 m^2$

7) Semicircle BCD = $\pi \times \frac{100}{2} \doteq 157.08m$

∴ Distance run = $157.08 + 150 = 307.08m$ (to nearest cm).

8) Using cos ratio

$\therefore \cos\theta = \frac{6}{12} = \frac{1}{2}$ $\therefore \theta = 60°$

9) Using sin ratio

$\therefore \sin 30° = \frac{3}{x}$ $\therefore x = 6 cm$

10) Cross-sectional area = $\frac{3}{2}(2+4) = 9m^2$

∴ Volume = $9 \times 2.5 = 22.5m^3$

11) Using Pythagoras' theorem,

$r = \sqrt{10^2 - 8^2} = 6 cm$

∴ Surface area = $2 \times \pi \times 6^2 + 2 \times \pi \times 6 \times 8$

$= 528 cm^2$

12) (a) $V = \pi \times 25^2 \times 20 = 39270 cm^3$

(b) $\pi \times 25^2 \times d = 7854$

∴ $d \doteq 4$ cm (to nearest cm)

(c) Mass of cake = $8 \times 75 = 600g$

Mass of each piece = $600 \div 12 = 50g$

13) (a) $\angle BCE = 30°$ (alternate angles, parallel lines).

Using cos rule on ΔCBE

$\therefore \cos 30 = \frac{x}{200}$ $\therefore x = 173.21$ (to nearest cm)

(b) Using sin ratio

$\sin 30 = \frac{BE}{200}$ $\therefore BE = 100m$

ALGEBRA

1) (A) $x \times x = x^2$; $x^2 + x^2 = 2x^2$

2) (B) $-3x \leq 12 \quad \therefore x \geq -4$

3) (A)

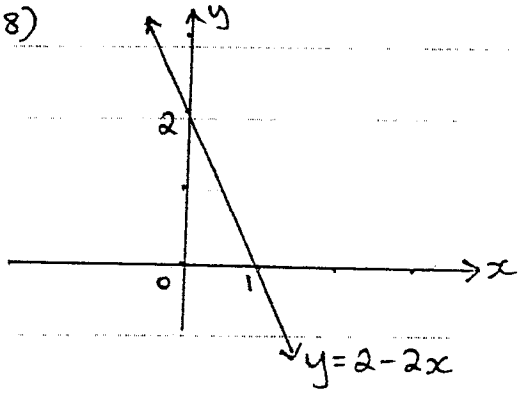
4) (D)

5) Length $= x + x + 5 = 2x + 5$

6) Gradient $= \frac{4}{2} = 2 \quad \therefore y = 2x + 4$

7) $P = 5 \times 75 - 25 = \$350$

8)

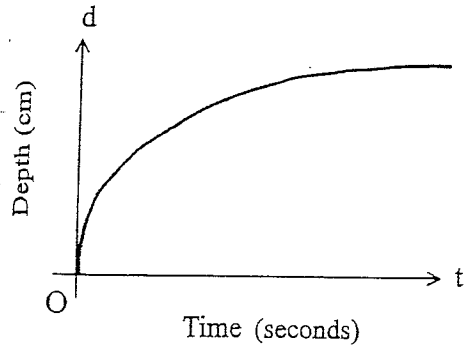


9) For first hexagon, she needs 6 matches. And for every other hexagon, she needs 5 matches.

$\therefore$ Hexagons made $= \frac{101-6}{5} + 1 = 20$

10) $\frac{3x}{4} - \frac{5x}{12} = \frac{9x-5x}{12} = \frac{4x}{12} = \frac{x}{3}$

11)



12) (a) Ronald's cost $= 50 + 80 \times 5 = \$450$

James' cost $= 50 + 80 \times 7 = \$610$

$\therefore$ James will pay \$160 more than Ronald.

(b) $1010 = 50 + 80n \quad \therefore n = 12$

$\therefore$ Veronica rented the car for 12 days.

(c) $C = 60 + 90n$

13) (a) Keys in level $9 = 8 \times 9 - 2 = 70$

Keys in level $10 = 10 \times 8 - 2 = 78$

$\therefore$ She can collect 8 more keys in level 10 than in level 9.

(b) $8L - 2 = 94 \quad \therefore L = 12$

$\therefore$ She was at level 12.

(c) Keys in level $(2p+1) = 8(2p+1) - 2$

$= 16p + 6$

Keys in level $p = 8p - 2$

$\therefore$ Difference $= 16p + 6 - 8p + 2 = 8p + 8$

$\therefore (8p + 8)$ more keys can be found in level $(2p+1)$.