SYDNEY BOYS HIGH
MOORE PARK, SURRY HILLS

2008
YEAR 7 YEARLY EXAMINATION

Mathematics

Directions to Candidates:

- Answer all questions in the spaces provided in this question booklet.

- If additional working space is needed, use the spare pages at the end of the booklet. Show clearly which question you are continuing.

- Full marks may not be awarded for careless or badly arranged work.

- Answers should be given in simplest exact form unless otherwise stated.

- Use black or blue pen for written answers, but pencil for diagrams and graphs.

- Board-approved calculators may be used.

Time allowed: 90 minutes
Examiner: Mr R. Boros

Your name: _____

Your Mathematics Class (Tick the box)	
7E Mr Gainford	
7F Mr Kourtesis	
7M Ms Nesbitt	
7R Ms Evans	
7S Ms Roessler	
7T Ms Ward	

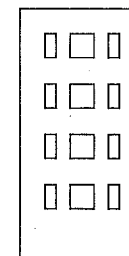| Markers' Use Only	
Question 1	/20
Question 2	/20
Question 3	/20
Question 4	/20
Question 5	/20
Question 6	/20
Total	/120

Marks

Question 1 (20 marks)   Answers

(a) Write a whole number in the box to get an answer between 5 and 5.5   [1]

$$\sqrt{\square}$$

(b) Estimate the value of $\sqrt{65}$, giving your answer as a whole number.   [1]

(c) The diagram shows a tower drawn to scale. What is the height of the tower?   [1]

Scale 1 : 2000

(d) The fraction $\dfrac{\square}{7}$ has a value between 8 and 9. Give one possible whole number for $\square$.   [1]

(e) What fraction subtracted from $\dfrac{1}{3}$ gives $\dfrac{1}{12}$?   [1]

(f) A rectangular paddock is to be sprayed to protect against insects. The cost of this is found using the formula:

$$C = \sqrt{L \times B} \times 1.6,$$
where L = Length in metres,
B = Breadth in metres,
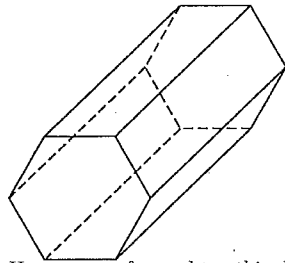C = Cost in dollars.

Find the cost of spraying a paddock whose dimensions are 144 m by 36 m.

[1]

(g) Adam's normal rate of pay is $7.30 per hour. On Saturdays he is paid one and a half times his normal rate. Last Saturday he worked from 9 am to 1 pm. How much was he paid that day?

[1]

(h) When John adds four to a number and doubles the result, he finds that he gets the same as four less than three times that number. Which of the following equations, when solved, will give John's number? (Circle any correct letters, but do *not* solve the equation.)

A. $2x + 4 = 3x - 4$ B. $2x + 8 = 3x - 4$
C. $2x + 4 = 4 - 3x$ D. $2x + 8 = 4 - 3x$

[1]

(i)

How many faces does this hexagonal prism have? Circle the correct answer(s).
A. 6   B. 7   C. 8   D. 9

[1]

(j) List all the subsets of $\{A, B, C\}$

[2]

(k) Write 1097 in Roman numerals.

[1]

(l) What is 0.632 as a fraction in its simplest form?

[1]

(m) Simplify $4k^3 \times 2k^4$

[1]

(n) Write down the largest 4-digit even number with a 5 in the hundreds place and a 7 in the tens place.

[1]

(o) $450 = 2 \times 3 \times 3 \times 5 \times 5$
       $9860 = 2 \times 2 \times 5 \times 17 \times 29$
Use the prime factors of the two numbers given above to find:
(i) the H.C.F. (highest common factor) of 450 and 9860.
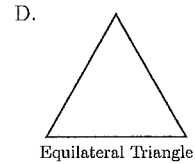
[1]

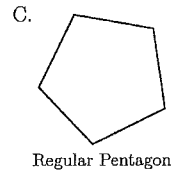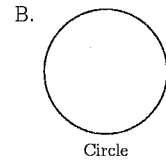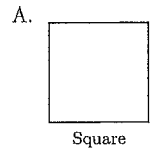(ii) the L.C.M. (lowest common multiple) of 450 and 9860.

[2]

(p) For which of the following equations will the solution be $x = 5$? (Circle any correct answers.)

    A. $4(x - 3) = 32$ B. $5 - (x + 2) = -2$

    C. $\dfrac{5 - x}{2} = 5$ D. $\dfrac{8 - x}{3} = 1$

    $\boxed{1}$

(q) Name one or more of the following plane figures (A, B, C, D) in which there are more than three axes of symmetry? Circle the correct letter(s).

    $\boxed{1}$

A.

Square

B.

Circle

C.

Regular Pentagon

D.

Equilateral Triangle

(a) There are 50 rabbits on a farm. Their number is expected to double every 3 months. How many months will it take for the number of rabbits to reach 1600?

    $\boxed{1}$

(b) A batsman scores 75 runs in the 1$^{\text{st}}$ innings and 90 runs in the 2$^{\text{nd}}$ innings. How many runs must he score in the 3$^{\text{rd}}$ innings to achieve an average of 78 runs per innings?

    $\boxed{1}$

(c) A house has increased in value by 10%, and it is now worth \$341 000. What was the house price before the increase?

    $\boxed{1}$

(d) Simplify $-5kl + 10lk - 7$.

    $\boxed{1}$

(e) Solve for x : $3 - x = 12$.

    $\boxed{1}$

(f) On a certain day at Rock Island, the temperature in the morning was $-5°$C. It went up by $12°$C by noon, and then down by $17°$C by the evening. What was the temperature in the evening?

[1]

(g) Andrew threw a die (numbered from 1 to 6) twice and got 6 twice. If Andrew throws the die again, what is the probability that he gets a 6 again?

[1]

(h) Sam looked in a mirror and saw the reflection of a clock-face as shown.
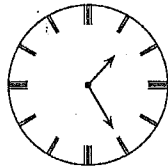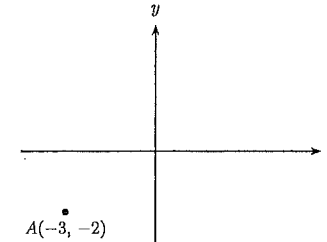

What was the correct time then?

[1]

(i) The numbers on opposite sides of this cube add up to 5.

What is the product of the numbers on the six faces?

[1]

(j)

$($, $)$

An ant at point $A(-3, -2)$ moves 4 units in a vertical direction to a point B. It then moves 2 units horizontally to the right. Find a possible set of co-ordinates for its final position.

[2]

(k) Insert a $<$ or $>$ sign in order to make a true statement: $\dfrac{22}{7}\ \square\ 3.142$

[1]

(l) Rewrite this recurring decimal Using the appropriate dot notation:

$$68.519519519\ldots$$

[1]

(m) Using your calculator, evaluate this expression correct to 3 decimal places:

$$\frac{3.7^3 + 3.7}{5 - \sqrt{26}}$$

[1]

(n) Simplify $|7| - |-9|$.

[1]

(o) What is 87 in base 2 (binary)? `1`

(p) Given that $A = \{M, A, T, H, S\}$
$\qquad\qquad\quad B = \{P, R, I, M, E, S\}$
list:
(i) $A \cup B$ `1`

(ii) $A \cap B$ `1`

(q) Write as a single numeral: `1`

$$6 \times 10^5 + 4 \times 10^3 + 3 \times 10 + 5$$

(r) The fraction halfway between $7\frac{3}{5}$ and W is $8\frac{1}{12}$. `1`
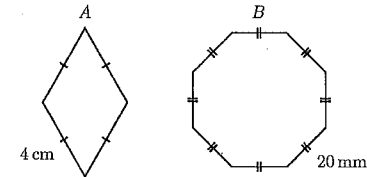Find the value of W as a mixed numeral.

Question 3 (20 marks) Answers

(a) Two pieces of wire, A and B, are used to form `2`
a rhombus and regular octagon respectively.
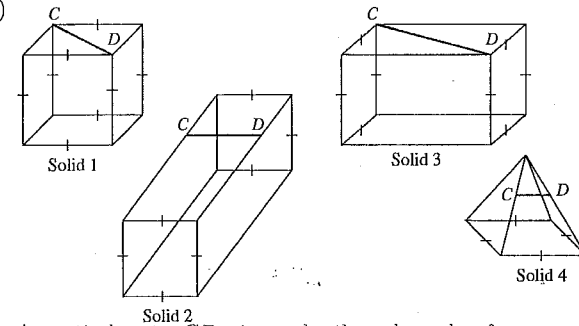

4 cm   20 mm

NOT TO SCALE

Which of the following statements is true?
(Circle the letter(s) of any correct answers.)
  A. The sum of the lengths of wires A and
     B is 32 mm.
  B. Wire A is longer than wire B.
  C. Wire B is longer than wire A.
  D. The sum of the lengths of wires A and
     B is 32 cm.

(b) `1`

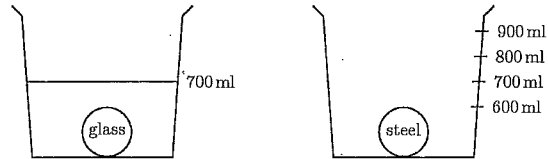Solid 1   Solid 2   Solid 3   Solid 4

A vertical cut, CD, is made through each of
the four solids drawn in the diagram. In
how many of these solids will the cross-
section made by the cut be a square?
  A. None of the four solids.   B. Three solids only.
  C. Two solids only.   D. One solid only.

(c) A solid has 6 edges and 4 vertices. Write down `1`
the name of the solid.

(d) Two balls, one glass and one steel, are the same size. They are to be placed separately in a tub containing 600 ml of water. When the glass ball is placed in the tub, the water level rises to 700 ml as shown. `[1]`

The glass ball is removed from the tub and the steel ball, which is three times as heavy as the glass ball, is put in the tub. Draw the new water level of the tub.

(e) Joanne wants to go for 3 nights on a holiday to Queensland. The table shows the packages offered to her including air-fare. `[1]`

A.	$600 for 3 nights
B.	$200 for each night
C.	$450 for first 2 nights, $150 for every extra night
D.	$400 for first 2 nights and $100 for every extra night

Which travel agent (A, B, C or D) offers the cheapest package to Joanne for 3 nights? (Circle the correct answer(s).)

(f) *Internet Specialist* monthly plans: `[2]`

	Cost for 50 hours	Cost of each hour above 50 hours
Plan A	$30	$2.00
Plan B	$40	$1.50

Vanessa and Jessica are both customers of the *Internet Specialist* company. They both used the internet for 60 hours in March 1999. Vanessa chose plan A and Jessica chose plan B.
Find the difference in their monthly bills during that month.

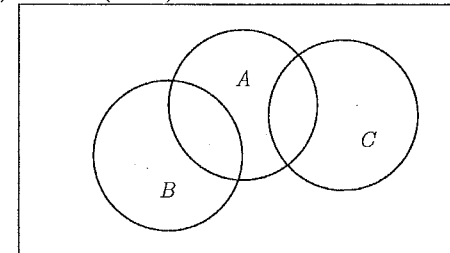(g) The perimeter of a rectangle is 24 cm. What could be the dimensions of the rectangle? (Circle all the correct answers.) `[2]`

    A. Length $= 18$ cm and width $= 6$ cm
    B. Length $= 9$ cm and width $= 3$ cm
    C. Length $= 0.14$ m and width $= 0.1$ m
    D. Length $= 0.1$ m and width $= 0.02$ m

(h) 3 target shooters scored $\frac{17}{19}, \frac{20}{22}$ and $\frac{13}{15}$, where the denominator is the number of rounds fired and the numerator is 'hits' on a target. To the nearest whole number, calculate the best score as a percentage. `[1]`
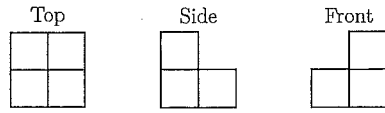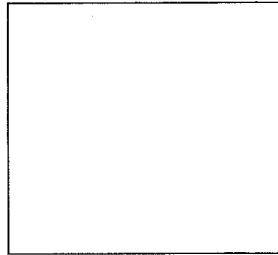
(i) Shade in $(A \cap C) \cup B$. `[2]`

(j) The diagram shows three views of a solid formed from centicubes. [2]

Top   Side   Front

Draw the three-dimensional solid in the space provided

(k) Doug is drawing an isosceles triangle PQR. PQ is one side of the triangle. Point R is to be on the dotted line through P. Complete the triangle so that $PQ = PR$. Show all construction lines. [1]

Q P

(l) Convert $101\,010\,111_2$ to a decimal numeral. [1]

(m) Jason is trying to call his friend Paul. He can remember [3]
- the first 6 digits of the 8-digit number,
- no 2 digits are the same,
- there are no zeroes in the number.

What is the maximum number of calls Jason needs to make to reach his friend (assuming all calls are answered)?
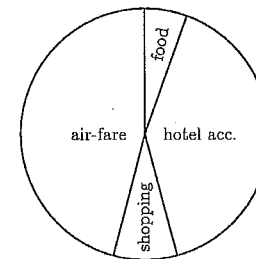
Question 4 (20 marks)

(a) A polyhedron has 30 faces, 17 vertices and 35 edges. Is it possible to create this figure? Give reasons for your answer. [1]

(b) The equation $k^2 - 3k = 0$ has $k = 3$ as one solution. If there is another solution, find it. [1]

(c) Simplify $7p^3 + 6p^3 - 2p^2$. [1]

(d) Simplify $(-3x^3y^2)^3$. [1]

(e) The sector graph shows how much money the Jones family spent on their last vacation. [2]

food

air-fare   hotel acc.

shopping

If they spent in total $10\,000$, how much did they spend on airfare (to the nearest $)?
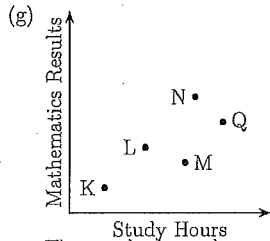
(f) Given $v^2 = u^2 + 2aS$ and $u = -5$, $a = 10$ and $S = 3.75$; find the two values of v.

$\boxed{2}$

(g)

The graph above shows the results gained by 5 students in a mathematics test and the hours they spent studying for the test. Find the student who studied fewer hours than N but had a higher result than M.

$\boxed{1}$

(h) Eric is ½ the age of his grandfather who is $14x+18$ years old. In 10 years time, what will the sum of their ages be?
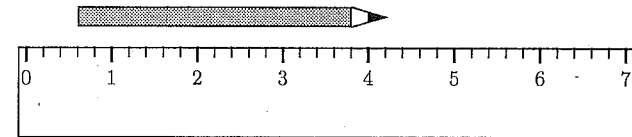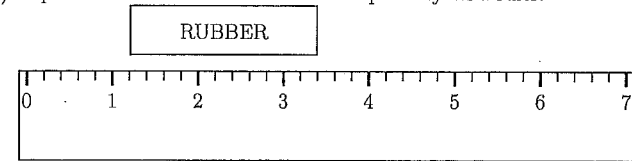
$\boxed{2}$

(i) Expand and simplify $3(2x - 5) - (2x - 5)$.
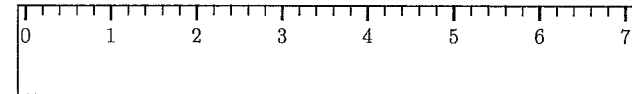
$\boxed{2}$

(j) A pencil and a rubber are measured separately on a ruler.

$\boxed{1}$

The rubber and the pencil, in this order, are then placed next to each other on the ruler. The left end of the rubber is on the zero. Draw the pencil and the rubber to show their position on the ruler below.

(k) The playground shown in the diagram below is to be rotated anti-clockwise about A through 90°. Accurately draw the new position of the playground on the diagram.
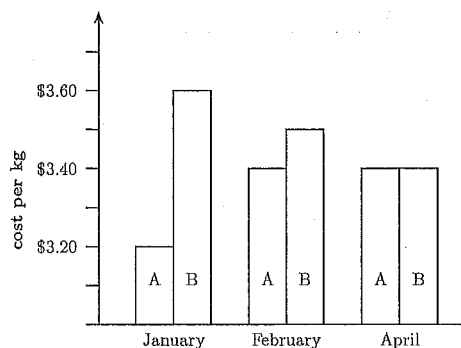
$\boxed{2}$
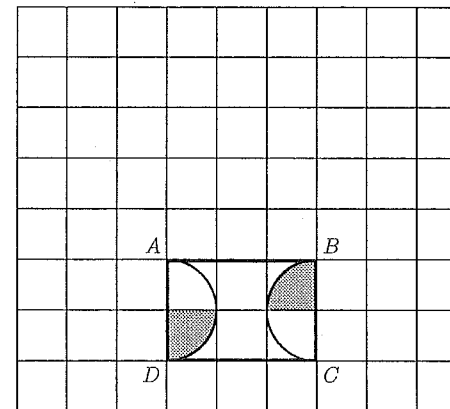
(l) The table below shows the percentage of cars at a car show.

Audi	Volkswagen	Mercedes	Saab
30%	10%	45%	15%

If there were 22 Volkswagens at the show, how many cars were NOT Audi?

(m)

The graph above compares the cost per kg of two types of soap, A and B, from January to April. Which of the following statements is correct? (Circle all correct answers.)

    A. In January, the cost of soap B was three times as much as the cost of soap A.

    B. The cost of soap A was constantly increasing from January to April.

    C. The cost of soap A doubled from January to February.

    D. The cost of soap B has decreased constantly from January to April.
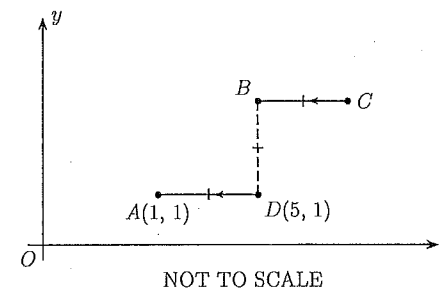
Marks

Question 5 (20 marks)

(a) Given $n(A \cup B) = 30$, $n(A) = 15$, $n(B) = 25$; find $n(A \cap B)$.

    [2]

(b) Find a pair of numbers, a and b, such that
$$5^a \div 5^b = 5^6.$$

    $a =$

    $b =$

    [2]

(c) What is the reciprocal of $-\dfrac{7}{20}$? Answer as a mixed numeral.

    [1]

(d) Graph all the whole numbers that are 3 units away from 1 on a number line.

    [2]

(e)

NOT TO SCALE

  (i) Find the length of AD.

    [1]

  (ii) Find the co-ordinates of the point B.

    [1]

  (iii) Find the co-ordinates of the point C.

    [1]

  (iv) What geometrical shape is $ABCD$?

    [1]

(f) John took 9 lessons of karate at equal intervals of time. His first lesson was on the 2nd of March and his last was on the 26th of the same month. On which day did John take his sixth lesson?

2

(g) Suppose I wanted to give away $1 000 000 000 but the rule was to give away $50 every minute of the day. How long would it take to give it all away? Full marks will only be given if your answer is given in the form: years, days, hours, and minutes (use only 365 days/year).

2

(h) In numbering the pages of a book, 408 digits were used. How many pages has the book?

3

(i) A job can be completed in 8 hours by 5 men working equal amounts. How long would 3 men take to do the job if they worked at a rate $33\frac{1}{3}\%$ faster?
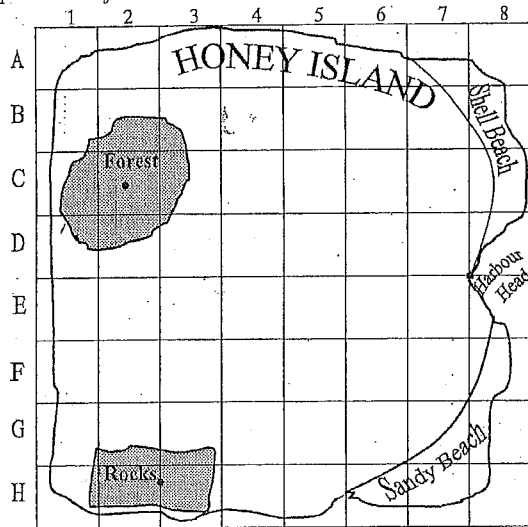
2

Question 6 (20 marks)

(a) Captain Bluebeard lost his map to the treasure he buried on Honey Island. He remembered that, by dividing the island into 64 squares and following a few steps, he could relocate his treasure.

[3]

- The treasure is located in the triangle formed by the centres of the oval shaped forest, the rectangular outcrop of rocks, and the harbour head.
- The treasure is located at the point of intersection of the perpendicular heights of this triangle.

Where is Captain Bluebeard's treasure? Give one co-ordinate pair where you think the treasure lies.

(b) The area of Tasmania is 67 800 square kilometres. The population of the world in 1987 was five thousand million. Suppose the entire population of the world moved to Tasmania: which of the following numbers most closely represents the average number of square metres each person would have?

[2]

A. 0.014   B. 0.14   C. 1.4   D. 14   E. 140

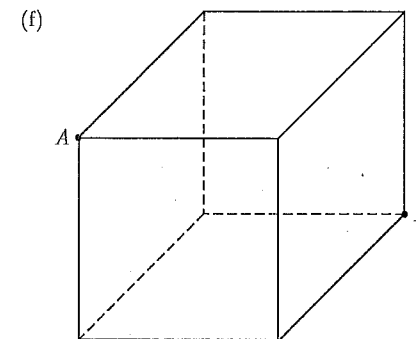(c) Find the sum of all the even positive divisors of 32 (including 32 itself).

[2]

(d) If $a > 0$ and $b < 0$, circle all the answers which *must* be true:

[3]

A. $a > -b$

B. $-a > b$

C. $a - b > 0$

D. $-a > -b$

E. $ab > 0$

(e) In a football competition there are 9 teams. If each team plays each other twice, Find the total number of matches played.

[3]

(f)

[2]

Ronny Ant is at corner A on a solid cube, and wants to reach corner B by the shortest path. Show carefully and clearly on the above diagram this shortest path.

(g) At a certain school there are 90 students studying for their HSC. They are required to study *at least* one of the subjects: Physics, French, or History. Of these students, 50 are studying Physics, 60 are studying French, and 55 are studying History. 30 students are studying *both* Physics and French, while 10 students are studying both French and History but not Physics. 20 students are studying all three subjects.

(i) Construct a Venn diagram which represents this situation. $\boxed{3}$

(ii) How many students are studying both Physics and History but not French? $\boxed{1}$

(iii) How many students are studying *at least* 2 of these 3 subjects? $\boxed{1}$

End of Paper

Question 1 (20 marks)   Answers   Marks

(a) Write a whole number in the box to   1
    get an answer between 5 and 5.5

$$\sqrt{\square}$$

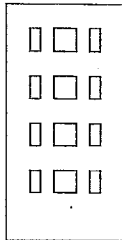$$\geqslant 26 \text{ and } < 30.25$$

(b) Estimate the value of $\sqrt{65}$, giving your answer   1
    as a whole number.

$$8.$$

(c) The diagram shows a tower drawn to scale.   1
    What is the height of the tower?

$$96m.$$

Scale 1 : 2000

(d) The fraction $\dfrac{\square}{7}$ has a value between 8 and 9.   1
    Give one possible whole number for $\square$.

$$\geqslant 57 \text{ and } \leqslant 64$$

(e) What fraction subtracted from $\dfrac{1}{3}$ gives $\dfrac{1}{12}$?   1

$$\frac{1}{4}.$$

(f) A rectangular paddock is to be sprayed to   1
    protect against insects. The cost of this is found
    using the formula:

$$C = \sqrt{L \times B} \times 1.6,$$

where $L =$ Length in metres,
$B =$ Breadth in metres,
$C =$ Cost in dollars.

$$\$.115.20$$

Find the cost of spraying a paddock whose
dimensions are 144 m by 36 m.

(g) Adam's normal rate of pay is \$7.30 per hour.   1
    On Saturdays he is paid one and a half times
    his normal rate. Last Saturday he worked from
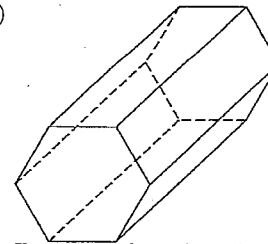   9 am to 1 pm. How much was he paid that day?

$$\$43.80$$

(h) When John adds four to a number and doubles   1
    the result, he finds that he gets the same as four
    less than three times that number. Which of the
    following equations, when solved, will give John's
    number? (Circle any correct letters, but do *not*
    solve the equation.)

A. $2x + 4 = 3x - 4$ B. $2x + 8 = 3x - 4$
C. $2x + 4 = 4 - 3x$ D. $2x + 8 = 4 - 3x$

$$B.$$

(i)   1

How many faces does this hexagonal prism
have? Circle the correct answer(s).
A. 6   B. 7   C. 8   D. 9

$$C.$$

(j) List all the subsets of $\{A, B, C\}$ $\boxed{2}$

$\{A,B,C\}, \; \emptyset \; \{A\} \; \{B\} \; \{C\}.$

$\{A,B\} \; \{A,C\} \; \{B,C\}.$

(k) Write 1097 in Roman numerals. $\boxed{1}$

MXCVII.

(l) What is 0.632 as a fraction in its simplest form? $\boxed{1}$

$\dfrac{79}{125}.$

(m) Simplify $4k^3 \times 2k^4$ $\boxed{1}$

$8K^7.$

(n) Write down the largest 4-digit even number with a 5 in the hundreds place and a 7 in the tens place. $\boxed{1}$

9578

(o) $450 = 2 \times 3 \times 3 \times 5 \times 5$
$9860 = 2 \times 2 \times 5 \times 17 \times 29$
Use the prime factors of the two numbers given above to find:

(i) the H.C.F. (highest common factor) of 450 and 9860. $\boxed{1}$

$2 \times 5 = 10$

(ii) the L.C.M. (lowest common multiple) of 450 and 9860. $\boxed{2}$

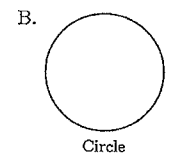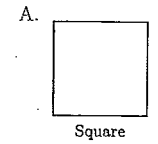$2^2 \times 3^2 \times 5^2 \times 17 \times 19 = 443,700.$

(p) For which of the following equations will the solution be $x = 5$? (Circle any correct answers.) $\boxed{1}$

A. $4(x-3) = 32$ B. $5 - (x+2) = -2$
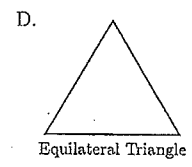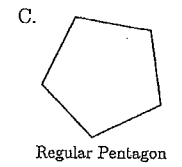C. $\dfrac{5-x}{2} = 5$ D. $\dfrac{8-x}{3} = 1$

B, D.

(q) Name one or more of the following plane figures (A, B, C, D) in which there are more than three axes of symmetry? Circle the correct letter(s). $\boxed{1}$

A.

Square

B.

Circle

A, B, C

C.

Regular Pentagon

D.

Equilateral Triangle

Question 2 (20 marks)   Answers

(a) There are 50 rabbits on a farm. Their number is expected to double every 3 months. How many months will it take for the number of rabbits to reach 1600? $\boxed{1}$

$15\,mths$

(b) A batsman scores 75 runs in the 1st innings and 90 runs in the 2nd innings. How many runs must he score in the 3rd innings to achieve an average of 78 runs per innings? $\boxed{1}$

$78 \times 3 = 234$

$234 - 165 = \underline{69}$

(c) A house has increased in value by 10%, and it is now worth $341 000. What was the house price before the increase? $\boxed{1}$

$\dfrac{341\,000}{110} \times 100$

$= \$310\,000$

(d) Simplify $-5kl + 10lk - 7$. $\boxed{1}$

$5kl - 7$

(e) Solve for x: $3 - x = 12$. $\boxed{1}$

$x = -9$

(f) On a certain day at Rock Island, the temperature in the morning was $-5°$ C. It went up by $12°$ C by noon, and then down by $17°$ C by the evening. What was the temperature in the evening? $\boxed{1}$
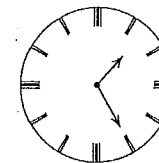
$-10°C$

(g) Andrew threw a die (numbered from 1 to 6) twice and got 6 twice. If Andrew throws the die again, what is the probability that he gets a 6 again? $\boxed{1}$

$\dfrac{1}{6}$

(h) Sam looked in a mirror and saw the reflection of a clock-face as shown. $\boxed{1}$

$25 \text{ to } 11$

What was the correct time then?

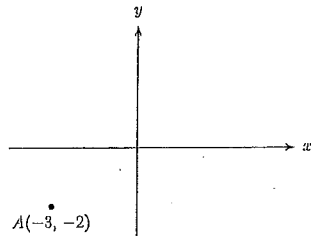(i) The numbers on opposite sides of this cube add up to 5. $\boxed{1}$

What is the product of the numbers on the six faces?

0

(j)

$A(-3, -2)$

An ant at point $A(-3, -2)$ moves 4 units in a vertical direction to a point B. It then moves 2 units horizontally to the right. Find a possible set of co-ordinates for its final position.

$(-3, 2)$
$(-1, 2$

[2]

$(-1, 2)$
or
$(-1, -6)$

(k) Insert a < or > sign in order to make a true statement: $\frac{22}{7} \ \Box \ 3.142$

$>$

[1]

(l) Rewrite this recurring decimal Using the appropriate dot notation:

$$68.519519519\ldots$$

$68.5\dot{1}\dot{9}$

[1]

(m) Using your calculator, evaluate this expression correct to 3 decimal places:

$$\frac{3.7^3 + 3.7}{5 - \sqrt{26}}$$

-548.912

[1]

(n) Simplify $|7| - |-9|$.

-2

[1]

(o) What is 87 in base 2 (binary)?

1010111_{two}

[1]

(p) Given that $A = \{M, A, T, H, S\}$
$B = \{P, R, I, M, E, S\}$
list:

(i) $A \cup B$

$\{A, E, H, I, M, P, R, S, T\}$

[1]

(ii) $A \cap B$

$\{M, S\}$

[1]

(q) Write as a single numeral:

$$6 \times 10^5 + 4 \times 10^3 + 3 \times 10 + 5$$

604035

[1]

(r) The fraction halfway between $7\frac{3}{5}$ and W is $8\frac{1}{12}$. Find the value of W as a mixed numeral.

[1]

$7\frac{3}{5} \quad 8\frac{1}{12} \quad W$

$8\frac{1}{12} + \frac{29}{60} = 8\frac{17}{30}$

$$\begin{array}{c|c|c}
2 & 87 & \\
2 & 43 & 1 \\
2 & 21 & 1 \\
2 & 10 & 1 \\
2 & 5 & 0 \\
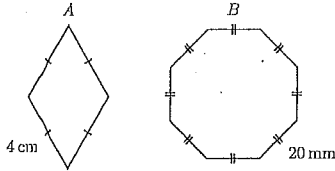2 & 2 & 1 \\
2 & 1 & 0 \\
 & 0 & 1 \\
\end{array}$$

Question 3 (20 marks)   Answers

(a) Two pieces of wire, A and B, are used to form a rhombus and regular octagon respectively.

$A = 16cm$

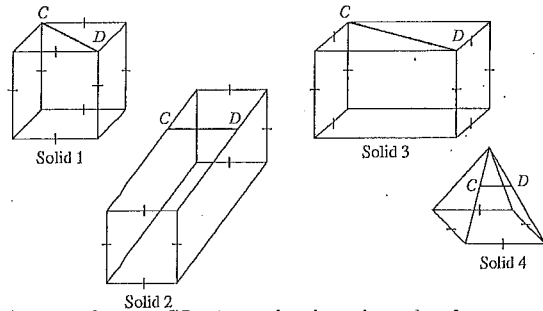$B = 160mm$

$. = 16cm$

4 cm

20 mm

NOT TO SCALE

$\boxed{2}$

D

Which of the following statements is true?
(Circle the letter(s) of any correct answers.)

~~A~~. The sum of the lengths of wires A and B is 32 mm.

~~B~~. Wire A is longer than wire B.

~~C~~. Wire B is longer than wire A.

(D) The sum of the lengths of wires A and B is 32 cm.

(b)

Solid 1

Solid 2

Solid 3

Solid 4

$\boxed{1}$

D

A vertical cut, CD, is made through each of the four solids drawn in the diagram. In how many of these solids will the cross-section made by the cut be a square?

A. None of the four solids.   B. Three solids only.

C. Two solids only.   (D.) One solid only.

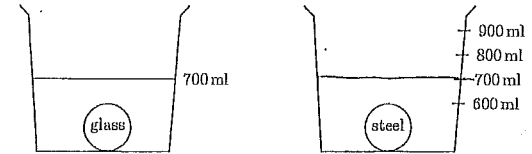(c) A solid has 6 edges and 4 vertices. Write down the name of the solid.   Triangular pyramid

$\boxed{1}$

(d) Two balls, one glass and one steel, are the same size. They are to be placed separately in a tub containing 600 ml of water. When the glass ball is placed in the tub, the water level rises to 700 ml as shown.

$\boxed{1}$

700 ml

glass

900 ml
800 ml
700 ml
600 ml

steel

The glass ball is removed from the tub and the steel ball, which is three times as heavy as the glass ball, is put in the tub. Draw the new water level of the tub.

(e) Joanne wants to go for 3 nights on a holiday to Queensland. The table shows the packages offered to her including air-fare.

$\boxed{1}$

A.	$600 for 3 nights
B.	$200 for each night
C.	$450 for first 2 nights, $150 for every extra night
(D.)	$400 for first 2 nights and $100 for every extra night

Which travel agent (A, B, C or D) offers the cheapest package to Joanne for 3 nights? (Circle the correct answer(s).)

(f) *Internet Specialist* monthly plans:

$\boxed{2}$

	Cost for 50 hours	Cost of each hour above 50 hours
Plan A	$30	$2.00
Plan B	$40	$1.50

Vanessa and Jessica are both customers of the *Internet Specialist* company. They both used the internet for 60 hours in March 1999. Vanessa chose plan A and Jessica chose plan B. Find the difference in their monthly bills during that month.

Plan A = $30 + 10 × $2

= $50

Plan B = $40 + 10 × $1·50

= $55

$5 difference

(g) The perimeter of a rectangle is 24 cm. What could be the dimensions of the rectangle? (Circle all the correct answers.) `2`

~~A.~~ Length = 18 cm and width = 6 cm

(B.) Length = 9 cm and width = 3 cm

~~C.~~ Length = 0.14 m and width = 0.1 m
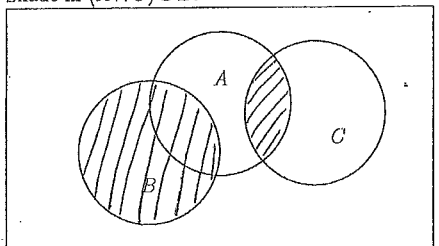
(D.) Length = 0.1 m and width = 0.02 m

(h) 3 target shooters scored $\frac{17}{19}, \frac{20}{22}$ and $\frac{13}{15}$, where the denominator is the number of rounds fired and the numerator is 'hits' on a target. To the nearest whole number, calculate the best score as a percentage. `1`

$17/19 = 89\%$ $13/5 = 87\%$

$20/22 = 91\%$

$\therefore 91\%$

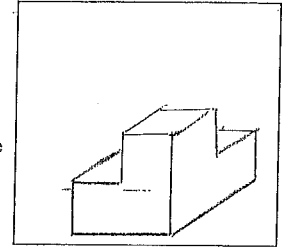(i) Shade in $(A \cap C) \cup B$. `2`

(j) The diagram shows three views of a solid formed from centicubes. `2`
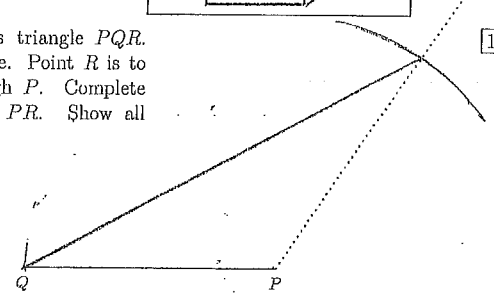
Top   Side   Front

Draw the three-dimensional solid in the space provided

(k) Doug is drawing an isosceles triangle PQR. PQ is one side of the triangle. Point R is to be on the dotted line through P. Complete the triangle so that $PQ = PR$. Show all construction lines. `1`

(l) Convert $101\,010\,111_2$ to a decimal numeral. `1`

256 128 64 32 16 8 4 2 1
1   0   1 0 1 0 1 1 1   = 343

(m) Jason is trying to call his friend Paul. He can remember `3`
- the first 6 digits of the 8-digit number,
- no 2 digits are the same,
- there are no zeroes in the number.

What is the maximum number of calls Jason needs to make to reach his friend (assuming all calls are answered)?

6 calls.

1 2 3 4 5 6 ? ?
                  7 8
                  7 9
                  8 7
                  8 9
                  9 7

Question 4 (20 marks)

(a) A polyhedron has 30 faces, 17 vertices and 35 edges. Is it possible to create this figure? Give reasons for your answer.

$$F + V = E + 2$$
$$30 + 17 = 35 + 2 \quad \times$$
$$\text{not possible}$$

(b) The equation $k^2 - 3k = 0$ has $k = 3$ as one solution. If there is another solution, find it.
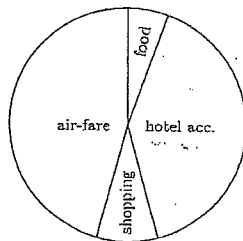
$$K = 0$$

(c) Simplify $7p^3 + 6p^3 - 2p^2$.

$$13p^3 - 2p^2$$

(d) Simplify $(-3x^3y^2)^3$.

$$-27x^9y^6$$

(e) The sector graph shows how much money the Jones family spent on their last vacation.

If they spent in total $10 000, how much did they spend on airfare (to the nearest $)?

$$10\,000 \times \frac{165}{360} = 4583.3$$
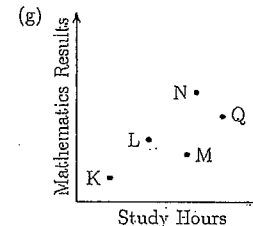$$= \$4583 \text{ nearest } \$$$

1

1

1

1

2

(f) Given $v^2 = u^2 + 2aS$ and $u = -5$, $a = 10$ and $S = 3.75$; find the two values of v.

$$v^2 = 25 + 2 \times 10 \times 3.75$$
$$= 100$$
$$V = 10 \text{ or } -10.$$

2

(g)

Study Hours

The graph above shows the results gained by 5 students in a mathematics test and the hours they spent studying for the test. Find the student who studied fewer hours than $\underline{N}$ but had a higher result than M.

$$L$$

1

(h) Eric is ½ the age of his grandfather who is $14x+18$ years old. In 10 years time, what will the sum of their ages be?

$$E = 7x + 9 \qquad G = 14x + 8$$
$$10 \text{ YRS TIME} \quad E + 10 = 7x + 19$$
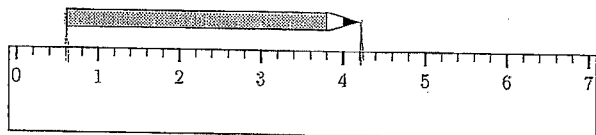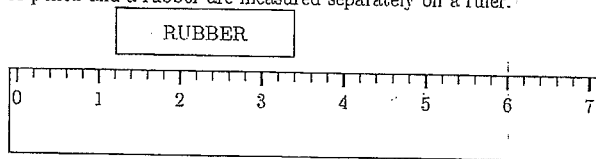$$G + 10 = 14x + 18$$
$$Sum = 21x + 47$$

2

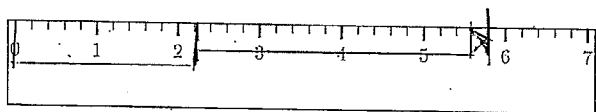(i) Expand and simplify $3(2x - 5) - (2x - 5)$.

$$6x - 15 - 2x + 5$$
$$4x - 10$$

2

(j) A pencil and a rubber are measured separately on a ruler.

RUBBER

The rubber and the pencil, in this order, are then placed next to each other on the ruler. The left end of the rubber is on the zero. Draw the pencil and the rubber to show their position on the ruler below.

(k) The playground shown in the diagram below is to be rotated anti-clockwise about A through $90°$. Accurately draw the new position of the playground on the diagram. 2
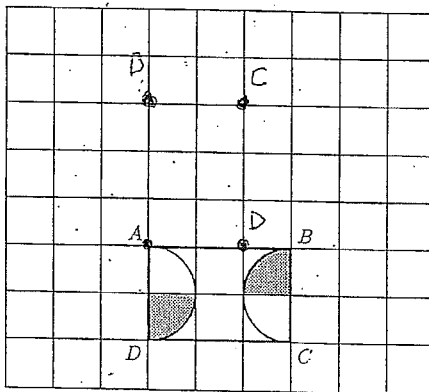
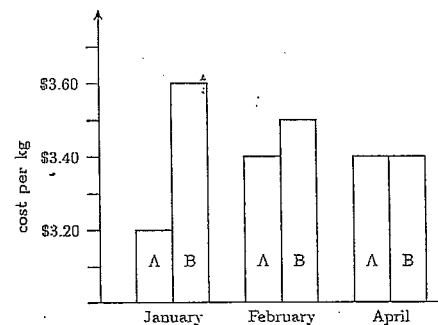(l) The table below shows the percentage of cars at a car show. 2

Audi	Volkswagen	Mercedes	Saab
30%	10%	45%	15%

If there were 22 Volkswagens at the show, how many cars were NOT Audi?

22 = 10% of cars
total 220 cars
NOT AUDI = 70% of 220
= 154 cars

(m) 2

The graph above compares the cost per kg of two types of soap, A and B, from January to April. Which of the following statements is correct? (Circle all correct answers.)

A. In January, the cost of soap B was three times as much as the cost of soap A.

B. The cost of soap A was constantly increasing from January to April.

The cost of soap A doubled from January to February.

D. The cost of soap B has decreased constantly from January to April.

Question 5 (20 marks)

(a) Given $n(A \cup B) = 30$, $n(A) = 15$, $n(B) = 25$;
find $n(A \cap B)$.

[2]

$$n(A \cup B) = n(A) + n(B) - n(A \cap B)$$
$$30 = 15 + 25 - n(A \cap B)$$

$$\boxed{n(A \cap B) = 10}$$

(b) Find a pair of numbers, a and b, such that
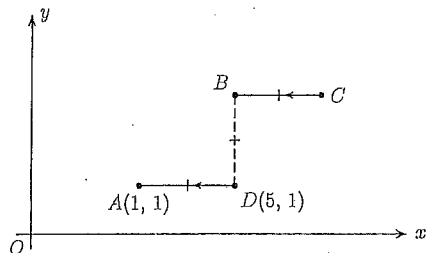
[2]

$a = 10$
$b = 4$

$$5^a \div 5^b = 5^6.$$

(c) What is the reciprocal of $-\dfrac{7}{20}$?
Answer as a mixed numeral.

[1]

$-\dfrac{20}{7}$ ie $\boxed{-2\frac{6}{7}}$

(d) Graph all the whole numbers that are 3 units
away from 1 on a number line.

[2]

$\boxed{-2 \text{ and } 4}$

(e)

NOT TO SCALE

(i) Find the length of AD. 4

[1]

(ii) Find the co-ordinates of the point B. $(5,5)$

[1]

(iii) Find the co-ordinates of the point C. $(9,5)$

[1]

(iv) What geometrical shape is $ABCD$? Parallelogram

[1]

(f) John took 9 lessons of karate at equal intervals
of time. His first lesson was on the 2nd of March
and his last was on the 26th of the same month.
On which day did John take his sixth lesson?

[2]

17th

(g) Suppose I wanted to give away $\$1\,000\,000\,000$
but the rule was to give away $\$50$ every minute
of the day. How long would it take to give it
all away? Full marks will only be given if your
answer is given in the form: years, days, hours,
and minutes (use only 365 days/year).

[2]

$$\frac{1\,000\,000\,000}{50} \text{ minutes}$$

$$= 20\,000\,000 \text{ minutes } \checkmark$$

$$= 333\,333\tfrac{1}{3} \text{ hours } \checkmark$$

$$= 13\,888\tfrac{8}{9} \text{ days } \checkmark$$

$$= 38.05 \text{ years } \checkmark$$

(h) In numbering the pages of a book, 408 digits were used. How many pages has the book? [3]

	PAGES	NO DIGITS
First	9	9
Next	90	180
Next	73	219

172 pages

(i) A job can be completed in 8 hours by 5 men working equal amounts. How long would 3 men take to do the job if they worked at a rate 33⅓% faster? [2]

Job requires $8 \times 5 = 40$ man hours

3 men working at ⅓ faster rate is equivalent to having 4 men doing the job.

∴ It would take 10 hours to do the job.

Question 6 (20 marks)

(a) Captain Bluebeard lost his map to the treasure he buried on Honey Island. He remembered that, by dividing the island into 64 squares and following a few steps, he could relocate his treasure. [3]

- The treasure is located in the triangle formed by the centres of the oval shaped forest, the rectangular outcrop of rocks, and the harbour head.
- The treasure is located at the point of intersection of the perpendicular heights of this triangle.

Where is Captain Bluebeard's treasure? Give one co-ordinate pair where you think the treasure lies.
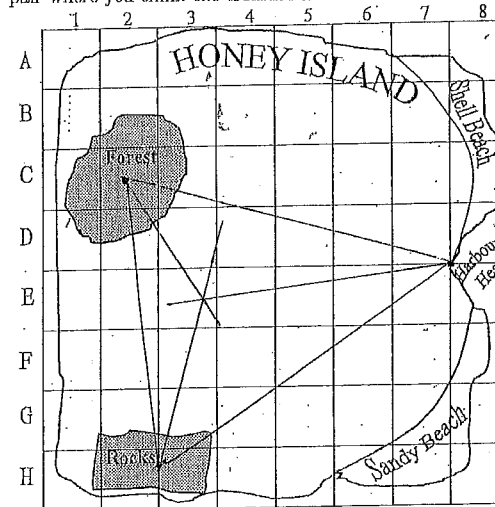
E3

or

3E

(b) The area of Tasmania is 67 800 square kilometres. The population of the world in 1987 was five thousand million. Suppose the entire population of the world moved to Tasmania: which of the following numbers most closely represents the average number of square metres each person would have? [2]
A. 0.014   B. 0.14   C. 1.4   D. 14   E. 140

$$\frac{67800 \times 10^6 \, m^2}{5000 \times 10^6}$$

$= 13.56$

D

(c) Find the sum of all the even positive divisors of 32 (including 32 itself). $\boxed{2}$

$32 + 16 + 8 + 4 + 2 = 62$

(d) If $a > 0$ and $b < 0$, circle all the answers which *must* be true: $\boxed{3}$

　　A. $a > -b$
　　B. $-a > b$
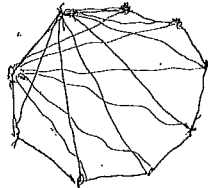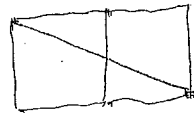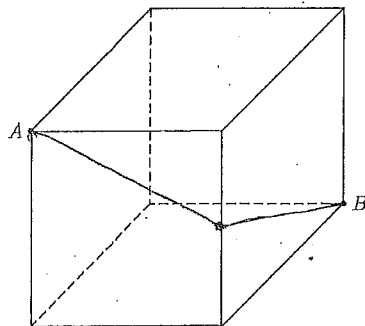　　C. $a - b > 0$　（circled）
　　D. $-a > -b$
　　E. $ab > 0$

$b < a$

$-b > -a$

(e) In a football competition there are 9 teams. If each team plays each other twice, Find the total number of matches played. $\boxed{3}$
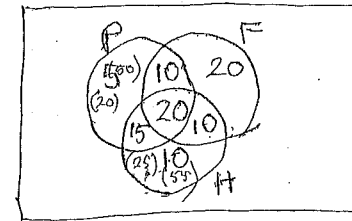
$9 \times 8 = 72$

(f) $\boxed{2}$

Ronny Ant is at corner A on a solid cube, and wants to reach corner B by the shortest path. Show carefully and clearly on the above diagram this shortest path.

(g) At a certain school there are 90 students studying for their HSC. They are required to study *at least* one of the subjects: Physics, French, or History. Of these students, 50 are studying Physics, 60 are studying French, and 55 are studying History. 30 students are studying *both* Physics and French, while 10 students are studying both French and History but not Physics. 20 students are studying all three subjects.

(i) Construct a Venn diagram which represents this situation. $\boxed{3}$

$n(P) = 50$
$n(F) = 60$
$n(H) = 55$
$n(P \cap F) = 30$
$n((F \cap H) \cap \tilde{P}) = 10$
$n(P \cap F \cap H) = 20$

(ii) How many students are studying both Physics and History but not French? $\boxed{1}$

15

(iii) How many students are studying *at least* 2 of these 3 subjects? $\boxed{1}$

55

End of Paper