SYDNEY BOYS HIGH SCHOOL
MOORE PARK, SURRY HILLS

Year 8

Yearly Examination 2009

Mathematics

NAME:

Class	Teacher	
8MaA	Ms Ward	
8MaB	Mr Hespe/Mr Kourtesis	
8MaC	Mr McQuillan	
8Ma1	Ms Evans	
8Ma2	Mr Boros/Ms Ward	
8Ma3	Mr Gainford/Ms Nesbitt	

Question	Mark
1	/19
2	/19
3	/19
4	/19
5	/16
6	/16
Total	/108

Question 1   (19 marks)

(a) Write the following as a percentage: [2]

   (i) $\frac{2}{5}$

   (ii) 0.415

(b) Find 3.8% of 72L.   [1]

(c)   [1]

$$8.1 \qquad P \qquad 8.2$$
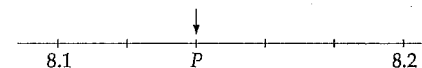
Write the decimal value represented by P.

(d) Simplify the following expressions: [7]

   (i) $2a - 3b - 5a$

   (ii) $5a \times 6ab$

   (iii) $4 \times a \times a \times a \times 7 \times a \times a$

   (iv) $\dfrac{5ab}{4p} \div \dfrac{15a^2}{8p}$

   (v) $x - \dfrac{x-1}{3}$
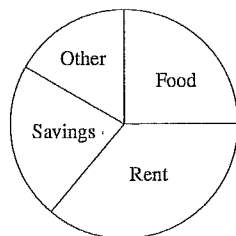
(e) Matthew has a weekly income of \$900 and allocates his money according to the budget shown in the sector graph. $\boxed{2}$

(i) How much money does Matthew allocate to food each week?

(ii) How long will it take Matthew to save \$3600?

(f) The stem-and-leaf plot represents the daily sales of soft drink from a vending machine. $\boxed{2}$

2	(N) 5 5
3	4 7 7 9
4	0 5 8
5	2
6	0 7

(i) If the range of sales is 43, what is the value of the circled N?

(ii) What is the median of sales?

(g) If $a = \frac{1}{4}$ and $b = -2$, evaluate the following: $\boxed{2}$

(i) ab^2

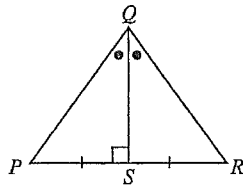(ii) $\dfrac{a}{1-b}$

(h) How many cm^2 in 3m^2? $\boxed{1}$

(i) How many dollars do I have if I have x cents? $\boxed{1}$
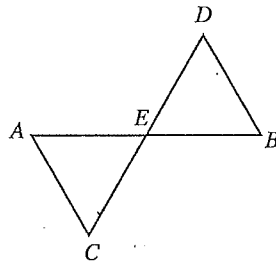
Question 2 (19 marks)

(a) The perimeter of a rectangle is 20 centimetres. The lengths of the sides are whole [2]
centimetres. Give TWO possible values for the area of the rectangle.

(b) State the test(s) that could be used to prove that each pair of triangles is congruent. [3]

(i)

(ii) Given that AB and CD bisect each other at E.

(c) Four radio stations reported the probability of rain as shown in the table. [1]

Radio station	Probability of rain
2AT	0.53
2BW	17%
2CZ	$\frac{13}{25}$
2DL	0.6

Which radio station reported the highest probability of rain?

(d) Simplify the following ratios fully: [4]

(i) $8 : 24 : 12$

(ii) $1.4 : 0.28$

(iii) $1\frac{1}{3} : \frac{3}{4}$

(iv) 65cm : 1.4m

(e) Expand and then simplify the following: $\boxed{5}$
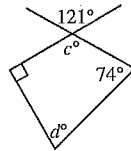
  (i) $(4a^4)^2$

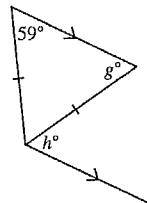 (ii) $a(2-b)-3(2a+3)$

  (iii) $(2x-5)^2$

(f) Find the values of the pronumerals in the following (no reasons are required): $\boxed{4}$

  (i)

  (ii)

Question 3   (19 marks)

(a) There are 100 tickets sold in a raffle. Justin sold all 100 tickets to five of his friends. $\boxed{3}$ The number of tickets he sold to each friend is shown in the table.

Friend	Number of tickets
Danielle	45
Khalid	5
Nancy	10
Shani	14
Herman	26
Total	100

  (i) Justin claims that each of his friends is equally likely to win first prize. Give a reason why Justin's statement is NOT correct.

  (ii) What is the probability that first prize is NOT won by Khalid or Herman?

(b) Mr Schneebly asked the students in his class how many brothers they had. The $\boxed{2}$ answers were recorded in a frequency table as follows.

Number of brothers	Frequency
0	5
1	10
2	3
3	1
4	1

  (i) What is the mean number of brothers?

  (ii) One of the students is chosen at random. What is the probability that this student has no brothers?

(c) Solve the following for x:

(i) $0.4x = 0.012$
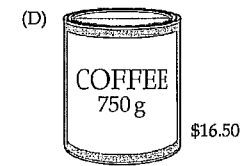
(ii) $1 - 4x = 9$

(iii) $\frac{x}{5} + x = 2$
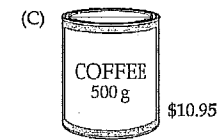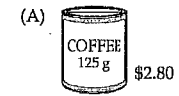
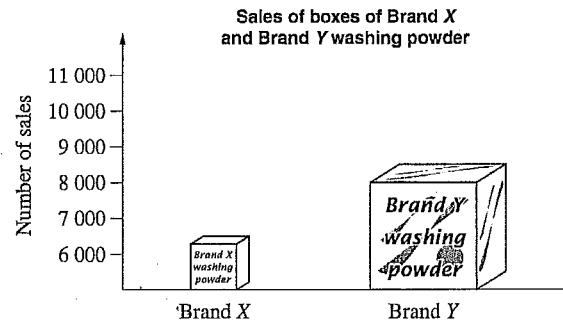(iv) $|x + 3| = 8$

(v) $(x - 2)(5 - x) = 7 - x^2$

(vi) $7 - 2x > 4$

12

(d) Circle which of these is the best buy.

2

(A)
COFFEE
125 g
$2.80

(B)
COFFEE
200 g
$4.55

(C)
COFFEE
500 g
$10.95

(D)
COFFEE
750 g
$16.50

Question 4   (19 marks)

(a)   [2]

Sales of boxes of Brand X
and Brand Y washing powder

Give TWO reasons why this graph is misleading.

(b) (i) Complete the table of values given the rule $y = 1 - 2x$ [3]

x	-1	0	1	2
y				

(ii) Hence, or otherwise, sketch $y = 1 - 2x$ on coordinate axes.

(c) Decrease 3.8km by 72%.   [1]

(d) Two towns are 145mm apart on a map which has a scale of 1 : 25000.   [2]

How far are the towns apart in kilometres?

(e) An Australian dollar recently bought 0.9 American dollars. How many Australian   [2]

dollars does an American dollar buy?(to the nearest cent)

(f) Simplify the following: [3]

(i) $2 - 4 \ (mod \ 5)$
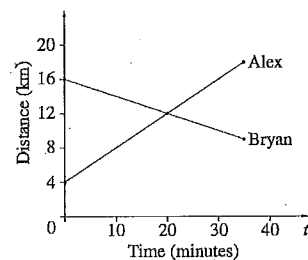
(ii) $16 \times 23 \ (mod \ 5)$

(iii) $3 \div 2 \ (mod \ 5)$

(g) At the same time, Alex and Bryan start riding towards each other along the only ⬚3
straight road into town. The graph shows their distances (in kilometres) from town
after t minutes.

(i) How many kilometres has Alex travelled when they meet?

(ii) At what speed is Bryan travelling (in km/h)?

(h) In a class of 40 students, 18 said they liked apple pie, 15 said they liked chocolate ⬚3
cake and 12 said they did not like either.

(i) Represent this information for the class in a Venn diagram.

(ii) Hence, or otherwise, find the probability that a randomly selected student:

(α) likes apple pie

(β) likes apple pie and chocolate cake
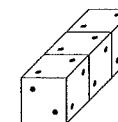
Question 5   (16 marks)

(a) If we place two dots on each face of a cube, there will be 12 dots on the outer surface. ⬚4

If two cubes are joined, the number of dots on the outer surface will be 20.

If three cubes are joined in the same way there will be 28 dots.

(i) Find the total number of dots on the outer surface of five cubes joined together
in the same way.

(ii) How many dots will there be on the outer surface of n cubes joined in the same
way?

(iii) How many cubes, joined in the same way, are needed if there are to be 236 dots
on the outer surface?

(b) Thomas is constructing a triangle XYZ using only a pair of compasses and a straight edge. Z lies on the dotted line. $\boxed{5}$

  (i) Showing all construction lines:

    (α) Bisect the angle at Y

    (β) Bisect the interval XY

  (ii) The angle at X is to be half the size of the angle at Y. Complete the triangle XYZ to accurately show the position of Z.

(c) Solve the following: $\boxed{4}$

  (i) $2x + 1 = 2 \ (mod \ 5)$

  (ii) $x^2 - 2 = 4 \ (mod \ 5)$
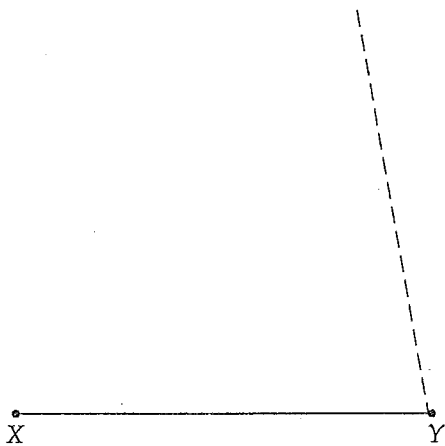
(d) Garry wants to wash his car. He uses a highly concentrated car shampoo that needs diluting with water. This car shampoo is mixed with water in the ratio $2 : 25$. This is then combined with more water in the ratio $3 : 4$. How much water is present in one litre of the final solution? (to the nearest millilitre) $\boxed{3}$

Question 6   (16 marks)

(a) Solve $-2 \le x + 1 < 1$ and graph the solution on the number line. $\boxed{2}$

(b) $\boxed{3}$
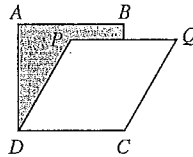
In the diagram above, $ABCD$ is a square with area 25cm². If $PQCD$ is a rhombus with area 20cm². Find the area of the shaded region, in cm².

(c) Using the irregular pentagon $ABCDE$, Rebecca is constructing a triangle AXY that is equal in area to the irregular pentagon $ABCDE$ using only a pair of compasses and a straight edge. $\boxed{4}$

   (i) Construct a line that passes through the vertex at B and is parallel to the line AC.
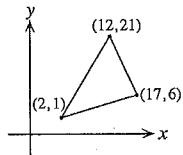
   (ii) Hence, or otherwise, finish constructing triangle AXY.
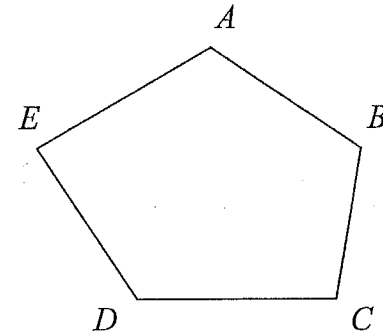
(d) A lattice point is a point (x, y), with x and y both integers. For example, $(2,3)$ is [3] a lattice point but $(4, \frac{1}{3})$ is not.

In the diagram below, how many lattice points lie on the perimeter of the triangle?

(e) (i) Write 1000 as the sum of two consecutive odd integers. [4]

(ii) In how many ways is it possible to write 1000 as a sum of consecutive odd integers?

End of paper

Question 1 (19 marks)

(a) Write the following as a percentage: $\boxed{2}$

(i) $\frac{2}{5}$

$5\overline{\smash{)}1\,{}^{.0}2^{.4}0}$ ... 0.4

$0.4 \times 100 = 40\%$

(ii) 0.415

41.5%

(b) Find 3.8% of 72L. $\boxed{1}$

$72.000 \times \frac{3.8}{100}$

$\begin{array}{r} 72 \\ \times 38 \\ \hline 576 \\ 216 \\ \hline 2736 \end{array}$

$2.736\,L$

(c) $\boxed{1}$

Write the decimal value represented by P.

8.14

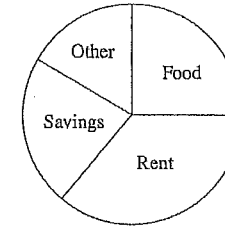(d) Simplify the following expressions: $\boxed{7}$

(i) $2a - 3b - 5a$

$-3b - 3a$

(ii) $5a \times 6ab$

$30a^2b$

(iii) $4 \times a \times a \times a \times 7 \times a \times a$

$28a^5$.

(iv) $\frac{5ab}{4p} \div \frac{15a^2}{8p}$

$\frac{5ab}{4p} \times \frac{8p^2}{15a^2} = \frac{2b}{3a}$

(v) $x - \frac{x-1}{3}$

$= \frac{3x - (x-1)}{3}$

$= \frac{3x - x + 1}{3}$

$= \frac{2x+1}{3}$

(e) Matthew has a weekly income of $900 and allocates his money according to the budget shown in the sector graph. $\boxed{2}$

(i) How much money does Matthew allocate to food each week?

$\frac{900}{4} = \$225$

(ii) How long will it take Matthew to save $3600?

$225\overline{\smash{)}3600}$ ... 16 weeks

$\begin{array}{r} 16 \\ 225\overline{\smash{)}3600} \\ 225 \\ \hline 1350 \\ 1350 \\ \hline 0 \end{array}$

16 weeks

(f) The stem-and-leaf plot represents the daily sales of soft drink from a vending machine. $\boxed{2}$

2	Ⓝ 5 5
3	4 7 7 9
4	0 5 8
5	2
6	0 7

(i) If the range of sales is 43, what is the value of the circled N?

$67 - 43 = 22$ N is 2

(ii) What is the median of sales?

39

(g) If $a = \frac{1}{4}$ and $b = -2$, evaluate the following: [2]

    (i) ab^2

$$\frac{1}{4} \times (-2)^2$$

$$= \frac{1}{4} \times 4$$

$$= 1$$

    (ii) $\frac{a}{1-b}$

$$\frac{\frac{1}{4}}{1--2}$$

$$= \frac{1}{12}$$

$$= \frac{1}{4} \times \frac{1}{3}$$

(h) How many cm² in 3m²? [1]

$$1 m^2 = 100\ 000\ cm^2$$

$$3 m^2 = 300\ 000\ cm^2$$

(i) How many dollars do I have if I have x cents? [1]

$$\frac{x}{100}\ dollars$$

Question 2   (19 marks)

(a) The perimeter of a rectangle is 20 centimetres. The lengths of the sides are whole centimetres. Give TWO possible values for the area of the rectangle. [2]
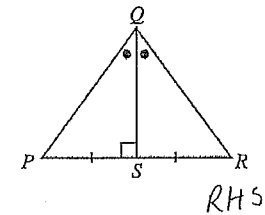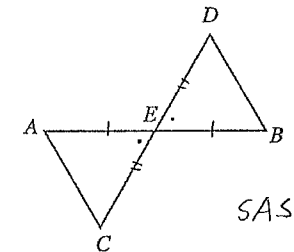
$$24 cm^2$$

$$21 cm^2$$

(b) State the test(s) that could be used to prove that each pair of triangles is congruent. [3]

    (i)

RHS

    (ii) Given that AB and CD bisect each other at E.

SAS

(c) Four radio stations reported the probability of rain as shown in the table. ☐1

Radio station	Probability of rain
2AT	0.53
2BW	17%
2CZ	$\frac{13}{25}$
2DL	0.6

Which radio station reported the highest probability of rain?

2DL

(d) Simplify the following ratios fully: ☐4

(i) $8 : 24 : 12$

$2 : 6 : 3$

(ii) $1.4 : 0.28$

$1400 : 28$ $100 : 2$

$700 : 14$ $50 : 1$

(iii) $1\frac{1}{3} : \frac{3}{4}$

$\frac{4}{3} : \frac{3}{4}$ $\times 12$ $16 : 9$

(iv) 65cm : 1.4m

$65 : 140$

$13 : 28$

(e) Expand and then simplify the following: ☐5

(i) $(4a^4)^2$

$16a^8$

(ii) $a(2 - b) - 3(2a + 3)$

$2a - ab - 6a - 9$

$-4a - ab - 9$

(iii) $(2x - 5)^2$

$4x^2 - 20x + 25$

(f) Find the values of the pronumerals in the following (no reasons are required): ☐4

(i)

$c = 121°$

  211
$+\ 74$
 285

 360
-285
 85

$d = 85°$

(ii)

$g = 59°$

$h = 59°$

Question 3 (19 marks)

(a) There are 100 tickets sold in a raffle. Justin sold all 100 tickets to five of his friends. [3]

The number of tickets he sold to each friend is shown in the table.

Friend	Number of tickets
Danielle	45
Khalid	5
Nancy	10
Shani	14
Herman	26
Total	100

(i) Justin claims that each of his friends is equally likely to win first prize. Give a reason why Justin's statement is NOT correct.

They bought different numbers of tickets

(ii) What is the probability that first prize is NOT won by Khalid or Herman?

$$\frac{69}{100}$$

(b) Mr Schneebly asked the students in his class how many brothers they had. The answers were recorded in a frequency table as follows. [2]

Number of brothers	Frequency
0	5
1	10
2	3
3	1
4	1

(i) What is the mean number of brothers?

$$20\overline{)23}$$
$$\frac{20}{30}$$
$$\frac{20}{100}$$
1.15 $\quad$ (1.15)

(ii) One of the students is chosen at random. What is the probability that this student has no brothers?

$$\frac{1}{4} \quad \text{or} \quad 25\%$$

(c) Solve the following for x: [12]

(i) $0.4x = 0.012$

$$x = \frac{0.012}{0.4}$$
$$= \frac{12}{400}$$

$400\overline{)1200}$ $\quad$ gives 0.03

$$x = 0.03$$

(ii) $1 - 4x = 9$

$$1 - 9 = 4x$$
$$4x = -8$$
$$x = -2$$

(iii) $\frac{x}{5} + x = 2$

$$x + 5x = 10$$
$$6x = 10$$
$$x = \frac{5}{3}$$

(iv) $|x + 3| = 8$

$-x - 3 = 8$ $\qquad$ $x + 3 = 8$
$-x = 11$ $\qquad\qquad$ $x = 5$
$x = -11$

$$\therefore x = 5, -11$$

(v) $(x - 2)(5 - x) = 7 - x^2$

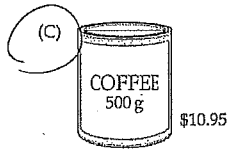$$5x - 10 - x^2 + 2x = 7 - x^2$$
$$7x = 17$$
$$x = \frac{17}{7}$$

(vi) $7 - 2x > 4$

$$3 > 2x$$
$$x < \frac{3}{2}$$
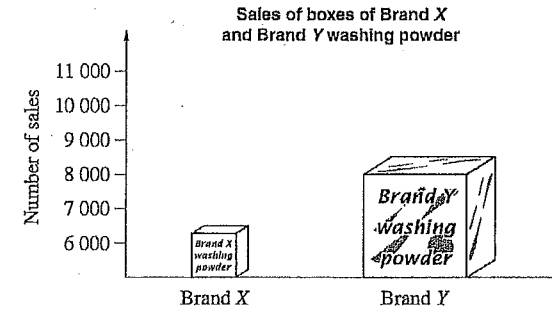
(d) Circle which of these is the best buy.

2

(A) COFFEE 125 g $2.80

(B) COFFEE 200 g $4.55

(C) COFFEE 500 g $10.95

(D) COFFEE 750 g $16.50

A) 1 kg = $22.40

B). 1 kg = $22.75

C). 1 kg = $21.90

D). 1 kg = $22.00

∴ C is the best to buy

Question 4   (19 marks)

(a)

2

Sales of boxes of Brand X and Brand Y washing powder

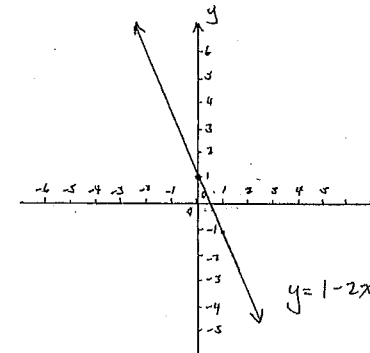Give TWO reasons why this graph is misleading.

The graph is 3D, making Brand Y looking bigger with its width

(b) (i) Complete the table of values given the rule $y = 1 - 2x$

3

x	-1	0	1	2
y	3	1	-1	-3

(ii) Hence, or otherwise, sketch $y = 1 - 2x$ on coordinate axes.

$y = 1 - 2x$

(c) Decrease 3.8km by 72%. $\boxed{1}$

$$3.8 \times \frac{72}{100}$$

$$2.736$$

$$3.8 - 2.736$$

$$= 1.064 \, km$$

(d) Two towns are 145mm apart on a map which has a scale of 1 : 25000. $\boxed{2}$

How far are the towns apart in kilometres?

$$145 \times 25000$$

$$= 3625000 \, mm$$

$$= 3.625 \, km$$

(e) An Australian dollar recently bought 0.9 American dollars. How many Australian $\boxed{2}$ dollars does an American dollar buy?(to the nearest cent)

$$1 : 0.9$$

$$1 \div 0.9$$

$$= \$1.1$$

$$or \quad \$1.11$$

(f) Simplify the following: $\boxed{3}$

(i) $2 - 4 \ (mod \ 5)$

$$3$$

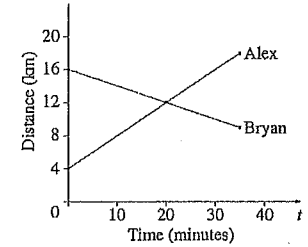(ii) $16 \times 23 \ (mod \ 5)$

$$3$$

(iii) $3 \div 2 \ (mod \ 5)$

$$4$$

(g) At the same time, Alex and Bryan start riding towards each other along the only $\boxed{3}$ straight road into town. The graph shows their distances (in kilometres) from town after t minutes.

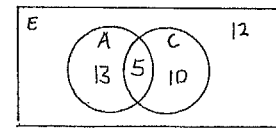(i) How many kilometres has Alex travelled when they meet?

$$12 - 4 = 8 \, km$$

(ii) At what speed is Bryan travelling (in km/h)?

$$\frac{60}{20} \times 4 = 12 \qquad 12 \, km/h$$

(h) In a class of 40 students, 18 said they liked apple pie, 15 said they liked chocolate $\boxed{3}$ cake and 12 said they did not like either.

(i) Represent this information for the class in a Venn diagram.

(ii) Hence, or otherwise, find the probability that a randomly selected student:

(α) likes apple pie $\qquad \dfrac{9}{20}$

(β) likes apple pie and chocolate cake

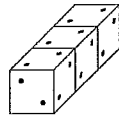$$\frac{5}{40} = \frac{1}{8}$$

Question 5   (16 marks)

(a) If we place two dots on each face of a cube, there will be 12 dots on the outer surface.   [4]

If two cubes are joined, the number of dots on the outer surface will be 20.

If three cubes are joined in the same way there will be 28 dots.

(i) Find the total number of dots on the outer surface of five cubes joined together
in the same way.

1	2	3
12	20	28

$y = 8x + 4$

$8 \times 5 + 4 = 44$

(ii) How many dots will there be on the outer surface of n cubes joined in the same
way?

$8n + 4$

(iii) How many cubes, joined in the same way, are needed if there are to be 236 dots
on the outer surface?

$8n + 4 = 236$
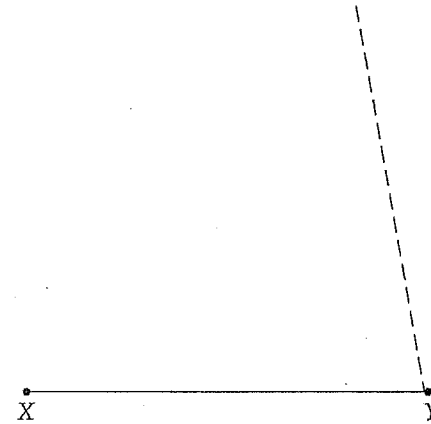
$8n = 232$

$n = 29$

(b) Thomas is constructing a triangle XYZ using only a pair of compasses and a straight   [5]
edge. Z lies on the dotted line.

(i) Showing all construction lines:

(α) Bisect the angle at Y

(β) Bisect the interval XY

(ii) The angle at X is to be half the size of the angle at Y. Complete the triangle
XYZ to accurately show the position of Z.

X Y

(c) Solve the following: [4]

   (i) $2x + 1 = 2 \ (mod \ 5)$

   (ii) $x^2 - 2 = 4 \ (mod \ 5)$

(d) Garry wants to wash his car. He uses a highly concentrated car shampoo that needs [3]
diluting with water. This car shampoo is mixed with water in the ratio 2 : 25.
This is then combined with more water in the ratio 3 : 4. How much water is present
in one litre of the final solution? (to the nearest millilitre)

$$27 \times 3$$

$$\frac{3}{7} \times \frac{25}{27}$$

$$= \frac{25}{63}$$

$$\frac{25}{63} + \frac{4}{7}$$

$$\frac{36}{63} + \frac{25}{63}$$

$$= \frac{61}{63}$$

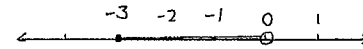$$\Rightarrow \frac{61}{63} \times 1000$$

$$= 0.968 \ L$$

Question 6   (16 marks)

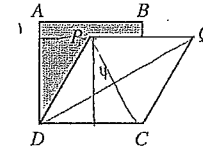(a) Solve $-2 \le x + 1 < 1$ and graph the solution on the number line. [2]

$$-3 \le x < 0$$

(b) [3]

In the diagram above, $ABCD$ is a square with area 25cm². If $PQCD$ is a rhombus
with area 20cm². Find the area of the shaded region, in cm².
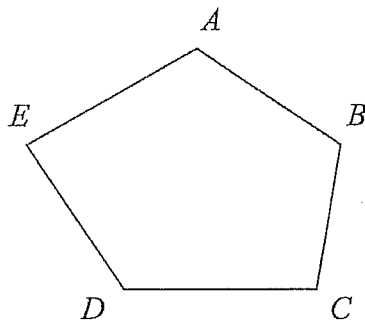
$$1 \times 5 + \frac{2.5 \times 4}{2}$$

$$= 5 + \frac{10}{2}$$

$$= 10$$

(c) Using the irregular pentagon $ABCDE$, Rebecca is constructing a triangle AXY that is equal in area to the irregular pentagon $ABCDE$ using only a pair of compasses and a straight edge. $\boxed{4}$
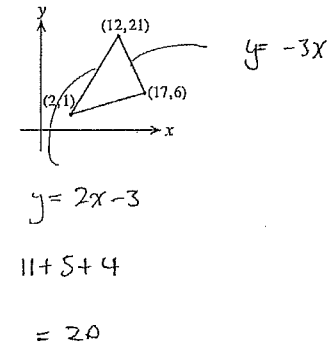
   (i) Construct a line that passes through the vertex at B and is parallel to the line AC.

   (ii) Hence, or otherwise, finish constructing triangle AXY.

(d) A lattice point is a point (x, y), with x and y both integers. For example, $(2, 3)$ is a lattice point but $(4, \frac{1}{3})$ is not. $\boxed{3}$

In the diagram below, how many lattice points lie on the perimeter of the triangle?

$y = -3x$

$y = 2x - 3$

$11 + 5 + 4$

$= 20$

(e) (i) Write 1000 as the sum of two consecutive odd integers. $\boxed{4}$

$499, 501$

   (ii) In how many ways is it possible to write 1000 as a sum of consecutive odd integers?

250

End of paper