Sydney Technical High School

Name: .....

Maths Class: .....

Year 10

Mathematics

Common Assessment Task

June 2017

Time Allowed: 70 Minutes

Instructions:

- Multiple choice to be completed on the back of this cover.
- Approved calculators may be used.
- Write using BLUE or BLACK pen only.
- Marks may not be awarded for illegible writing.
- Marks are indicated in brackets next to question.
- Show all necessary working.

Multiple Choice	/5
Quadratic Equations (Q)	/12
Probability	/12
Consumer Arithmetic(C)	/13
Number Plane(N)	/12
Miscellaneous (C+N+Q) /2+ /5+ /5	/12
TOTAL	/66

Sydney Technical High School

MULTIPLE CHOICE ANSWER SHEET

YEAR 10 MATHEMATICS

2 June 2017

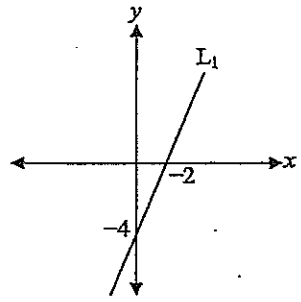
Completely fill the response oval representing the most correct answer.
Do not remove this sheet from the answer booklet.

1. A ○ B ○ C ○ D ○
2. A ○ B ○ C ○ D ○
3. A ○ B ○ C ○ D ○
4. A ○ B ○ C ○ D ○
5. A ○ B ○ C ○ D ○

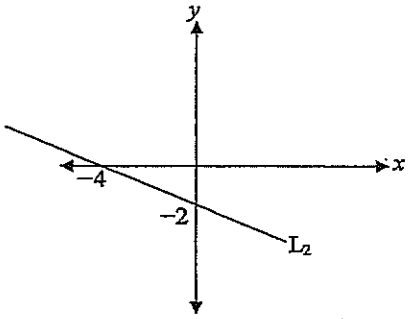
Section 1 – Multiple Choice. Use separate answer sheet

1. Which of the lines shown has equation $y = -2x - 4$?

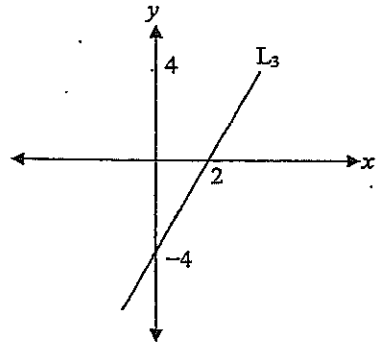
(A)



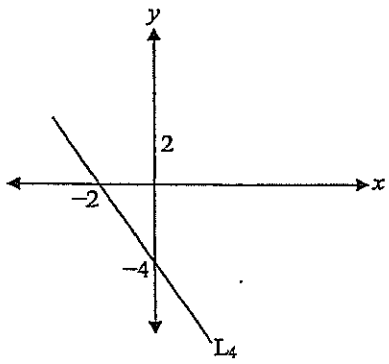
(B)



(C)



(D)



2. A bag has a number of cards, identical in size, with either the number 1, 2, 5 or 10 written on them. The table shows how many cards with these numbers are in the bag.

Number on card	Number of cards
1	10
2	8
5	6
10	1

A card with the number 5 is drawn from the bag and not replaced.

If a second card is randomly drawn from the bag, what is the probability that the sum of the numbers on the two cards will be less than 10?

A) $^{3}/_{4}$

B) $^{24}/_{25}$

C) $^{23}/_{72}$

D) 1

3. $6000 is invested at 8% p.a. for 5 years with interest compounded quarterly. What is the final value of this investment?

A) $7313.97

B) $8400

C) $8815.97

D) $8915.68

4. Solve $2x^2 + 5x - 1 = 0$

A) $x = \frac{-5 \pm \sqrt{17}}{2}$

B) $x = \frac{-5 \pm \sqrt{33}}{2}$

C) $\frac{-5 \pm \sqrt{17}}{4}$

D) $x = \frac{-5 \pm \sqrt{33}}{4}$

5. Which equation does NOT have a factor of $m + 1$

A) $m^2 - 1 = 0$

B) $m^2 + 1 = 0$

C) $m^2 + m = 0$

D) $m^2 + 2m + 1 = 0$

Section 2 - Show working and answers in the space provided.

Part A - Quadratic Equations (12 marks)

Marks

1. Complete the following and write as a perfect square: (1)

$x^2 - 22x + \square = (x + \square)^2$

2. Solve $(2x - 1)(x + 6) = 0$ (1)

3. Solve $x^2 + 13x + 36 = 0$ (2)

4. Solve $3x^2 - 7x + 2 = 0$ (2)

5. Find the exact solutions of (2)

$3x^2 + x - 5 = 0$

Marks

6. Find the exact solutions of (1)

$(x + 3)^2 = 14$

7. Solve $x^2 = 15x$ (1)

8. Solve $\frac{2}{x+3} + \frac{x+3}{2} = \frac{10}{3}$ (2)

Part B - Probability (12 marks) Marks

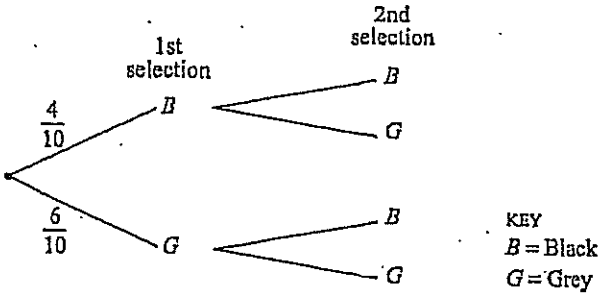
1. Kayla conducted an experiment in which she recorded the outcomes of repeatedly tossing two coins. The table shows the number of times each possible outcome occurred over 80 tosses. (1)

Outcome	Frequency
Two heads	20
Two tails	18
One head and one tail	42

Use this information to find the experimental probability of an outcome of two tails.

2. Sebastian has 4 black socks and 6 grey socks in his drawer. He selects 2 socks at random without replacement.

(i) On the tree diagram below write the probability on each branch. (2)



(ii) What is the probability that he selects a pair of socks matching in colour? (2)

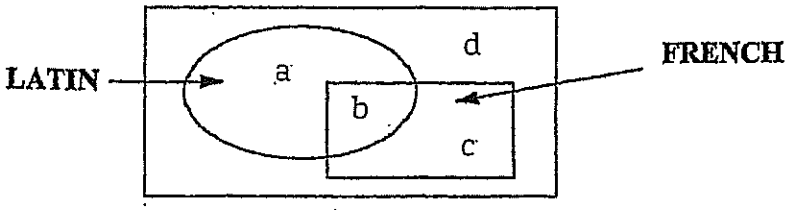
Marks

3. The following two-way table records the results of driving tests over a six month period: (1)

	Males	Females	*Total*
Passed on first attempt	61	59	120
Passed on second attempt	15	13	28
Total	76	72	148

What is the probability that if a person who completed the driving test was chosen at random, this person would be female and passed the test on the second attempt?

4. In a group of 35 students, 20 study French, 14 study Latin and 7 study neither French nor Latin



(i) How many students belong in region b? (1)

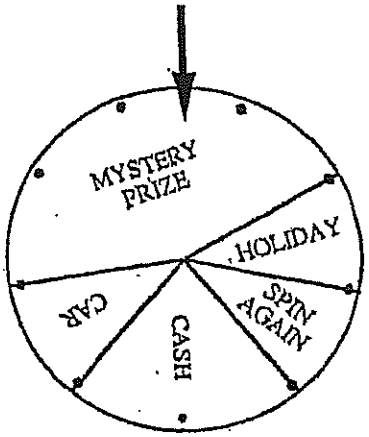
If a student is selected at random, find the probability that the student

(ii) studies Latin only? (1)

(iii) does not study Latin? (1)

Marks

5. (1)



When Gilda won a game show she spun a wheel to determine her prize.

What is the probability that Gilda will win a mystery prize in one spin?

6. Two dice are rolled. Find the probability of the sum of the numbers being less than 10. (2)

Part C - Consumer Arithmetic (12 marks) Marks

1. A builder quoted $18250 to complete some renovations requested by a homeowner. This included 10% GST. Calculate the GST. (1)

2. The following table shows the monthly repayments on a $1000 loan for different interest rates and different terms (number of years).

Annual interest rate	10 years	15 years	20 years	25 years
5%	$10.61	$7.91	$6.60	$5.85
5.25%	$10.73	$8.04	$6.74	$5.99
5.5%	$10.85	$8.17	$6.88	$6.14
5.75%	$10.98	$8.30	$7.00	$6.29
6.00%	$11.10	$8.44	$7.16	$6.44

Jackson wants to take out a loan of $450,000 at an annual interest rate of 5.5%.

(i) What would be Jackson's monthly repayments on this loan over a 20 year term? (1)

(ii) What total amount would Jackson repay over the 20 year term? (1)

(iii) How much interest would be charged on Jackson's loan over the 20 year term? (1)

(iv) How much interest would Jackson save if he repaid his loan over 15 years instead of 20 years? (The same 5.5% interest rate applies). (2)

Marks

3. Thomas borrows $15000 to buy a new car. A flat rate of interest is charged at 9.6% p.a. for 4 years. He repays the loan plus interest in equal monthly payments. Calculate the monthly repayments. (2)

4. Ross buys a new car for $46000. Find the depreciated value after 4 years if its value depreciates at the rate of 18% p.a. (1)

5. Petra's hourly rate of pay is $42.80. During a particular week, she is paid for 25 normal hours, 4 hours at time-and-a-half and 2 hours at the double time rate. Find her total pay for the week. (1)

6. Sam invested $2000 at 8% pa to be compounded annually.

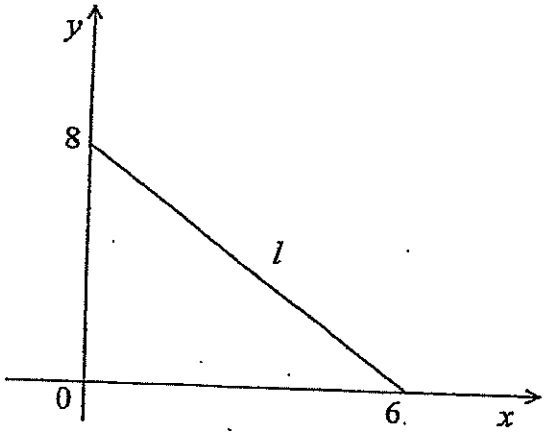
(i) What is the value of his investment after 5 years? (1)

(ii) Sam needs to have $4000 at the end of 5 years. What interest rate compounded annually would give him this amount? Give your answer correct to one decimal place. (2)

Part D - Number Plane (12 marks)

Marks

1. (1)



What is the equation of the line l in gradient intercept form?

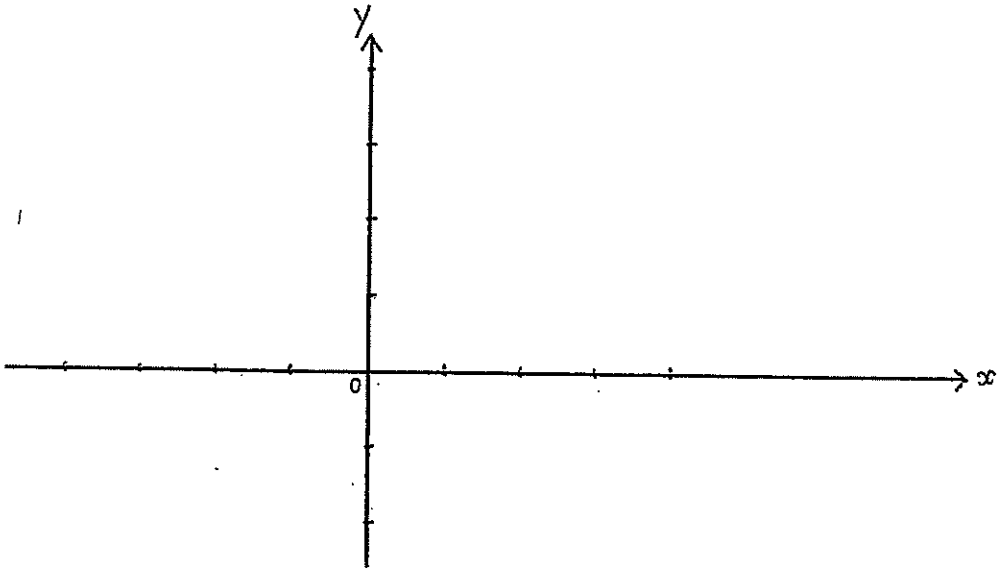
2. The lines $2x - 3y - 11 = 0$ and $3x + 2y + 29 = 0$ intersect at $(-5, y)$. (1)

Find the value of y.

3. Find the distance between (-2, 3) and (5, 6) as a surd. (1)

Marks

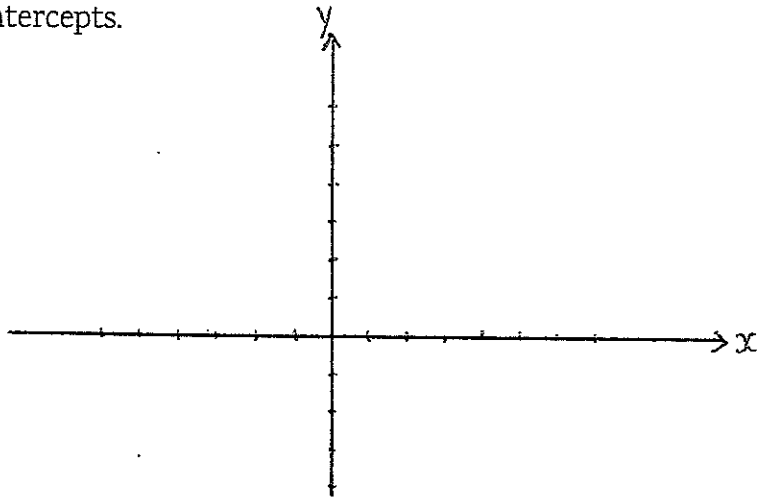
4. On the number plane below, shade the region represented by $y < x + 2$ (2)



5. The point $(1, 2)$ is the midpoint of $A(-2, 4)$ and $B(x, y)$. Find the coordinates of B. (2)

6. Find the equation of the straight line which passes through the point (4, -3) and is parallel to the line $x - 2y - 10 = 0$. Give your answer in general form. (3)

7. Sketch $y = (x - 2)^2$ on the number plane below showing the vertex and any x *and* y intercepts. (2)



Part E - Miscellaneous (12 marks) Marks

1. Luke works a 40 hour week at a fixed hourly rate. He receives a holiday loading that is 17½% of four weeks pay. His holiday loading last year was $602. What was his hourly rate of pay? (2)

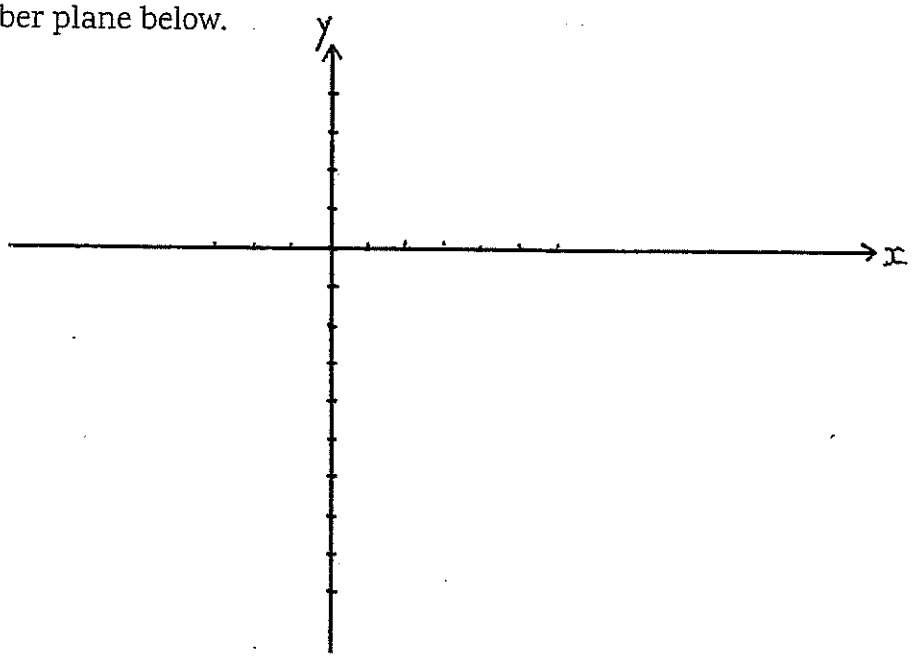
2. For the parabola $y = -x^2 + 6x - 8$ find:

(i) the x intercepts (2)

(ii) the y intercept (1)

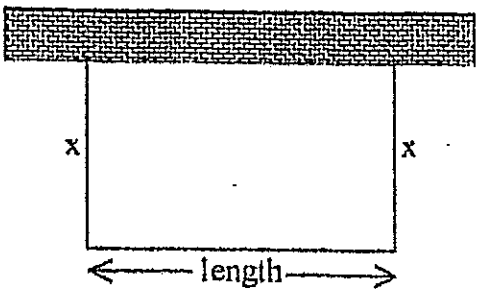
(iii) the coordinates of the vertex (1)

(iv) Show all of the above on a graph of the parabola on the number plane below. (1)



Marks

3. A rectangular garden is to have a wall on one side. It has fencing around the other three sides.



(i) If the gardener has 25m of fencing, write an expression for the length of the garden in terms of x. (1)

(ii) If the area of the garden is 75m^2, write an equation in terms of x connecting the length, width and area of the field, (1)

(iii) Solve your equation in part (ii) to find the possible dimensions of the field. (3)

Sydney Technical High School

Name: Answers

Maths Class: .....

Year 10

Mathematics

Common Assessment Task

June 2017

Time Allowed: 70 Minutes

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Multiple Choice	/5
Quadratic Equations (Q)	/12
Probability	/12
Consumer Arithmetic(C)	/13
Number Plane(N)	/12
Miscellaneous (C+N+Q) /2+ /5+ /5	/12
TOTAL	/66

Sydney Technical High School

MULTIPLE CHOICE ANSWER SHEET

YEAR 10 MATHEMATICS

2 June 2017

Completely fill the response oval representing the most correct answer.
Do not remove this sheet from the answer booklet.

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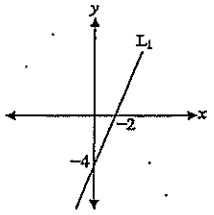
2. A ● B ○ C ○ D ○
3. A ○ B ○ C ○ D ●
4. A ○ B ○ C ○ D ●
5. A ○ B ● C ○ D ○

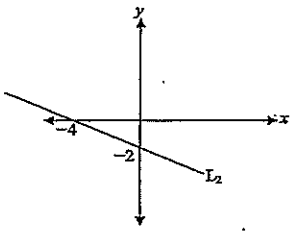
Section 1 – Multiple Choice. Use separate answer sheet

1. Which of the lines shown has equation $y = -2x - 4$?

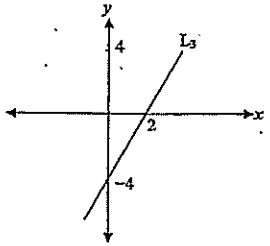
(A)



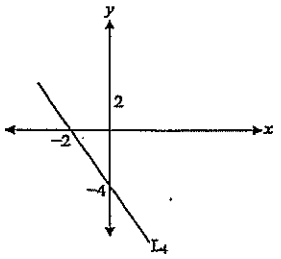
(B)



(C)



(D)



2. A bag has a number of cards, identical in size, with either the number 1, 2, 5 or 10 written on them. The table shows how many cards with these numbers are in the bag.

Number on card	Number of cards
1	10
2	8
5	6
10	1

A card with the number 5 is drawn from the bag and not replaced.

If a second card is randomly drawn from the bag, what is the probability that the sum of the numbers on the two cards will be less than 10?

A) $^3/_4$

B) $^{24}/_{25}$

C) $^{23}/_{72}$

D) 1

3. $6000 is invested at 8% p.a. for 5 years with interest compounded quarterly. What is the final value of this investment?

A) $7313.97

B) $8400

C) $8815.97

D) $8915.68

4. Solve $2x^2 + 5x - 1 = 0$

A) $x = \frac{-5 \pm \sqrt{17}}{2}$

B) $x = \frac{-5 \pm \sqrt{33}}{2}$

C) $\frac{-5 \pm \sqrt{17}}{4}$

D) $x = \frac{-5 \pm \sqrt{33}}{4}$

5. Which equation does NOT have a factor of $m + 1$

A) $m^2 - 1 = 0$

B) $m^2 + 1 = 0$

C) $m^2 + m = 0$

D) $m^2 + 2m + 1 = 0$

Section 2 - Show working and answers in the space provided.

Part A - Quadratic Equations (12 marks)

Marks

1. Complete the following and write as a perfect square: (1)

$x^2 - 22x + \boxed{121} = (x + \boxed{-11})^2$

2. Solve $(2x-1)(x+6) = 0$ (1)

$x = \frac{1}{2}$ or -6

3. Solve $x^2 + 13x + 36 = 0$ (2)

$x = -4$ or -9

4. Solve $3x^2 - 7x + 2 = 0$ (2)

$(3x-1)(x-2) = 0$

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

5. Find the exact solutions of (2)

$3x^2 + x - 5 = 0$

$x = \frac{-1 \pm \sqrt{1^2 - 4 \times 3 \times -5}}{6}$

$= \frac{-1 \pm \sqrt{61}}{6}$

Marks

6. Find the exact solutions of (1)

$(x+3)^2 = 14$

$x + 3 = \pm\sqrt{14}$

$x = -3 \pm \sqrt{14}$

7. Solve $x^2 = 15x$ (1)

$x^2 - 15x = 0$

$x(x-15) = 0$

$x = 0$ or 15

8. Solve $\frac{2}{x+3} + \frac{x+3}{2} = \frac{10}{3}$ (2)

Multiply throughout by LCD $= 6(x+3)$

$12 + 3(x+3)^2 = 20(x+3)$

$12 + 3(x^2 + 6x + 9) = 20x + 60$

$12 + 3x^2 + 18x + 27 = 20x + 60$

$3x^2 - 2x - 21 = 0$ ①

$(3x+7)(x-3) = 0$

$x = \frac{-7}{3}$ or 3

Part B - Probability (12 marks)

Marks

1. Kayla conducted an experiment in which she recorded the outcomes of repeatedly tossing two coins. The table shows the number of times each possible outcome occurred over 80 tosses. (1)

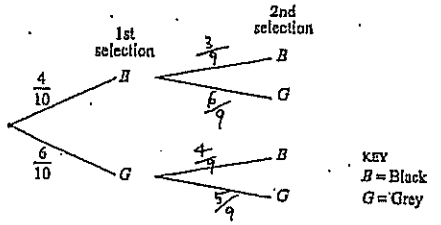
Outcome	Frequency
Two heads	20
Two tails	18
One head and one tail	42

Use this information to find the experimental probability of an outcome of two tails.

$\frac{18}{80} = \frac{9}{40}$

2. Sebastian has 4 black socks and 6 grey socks in his drawer. He selects 2 socks at random without replacement.

(i) On the tree diagram below write the probability on each branch. (2)



(ii) What is the probability that he selects a pair of socks matching in colour? (2)

$P(BB \text{ or } GG) = \frac{4}{10} \times \frac{3}{9} + \frac{6}{10} \times \frac{5}{9}$

$= \frac{42}{90}$

$= \frac{21}{45} = \frac{7}{15}$

Marks

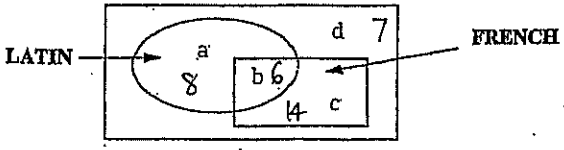
3. The following two-way table records the results of driving tests over a six month period: (1)

	Males	Females	*Total*
Passed on first attempt	61	59	120
Passed on second attempt	15	13	28
Total	76	72	148

What is the probability that if a person who completed the driving test was chosen at random, this person would be female and passed the test on the second attempt?

$\frac{13}{148}$

4. In a group of 35 students, 20 study French, 14 study Latin and 7 study neither French nor Latin



(i) How many students belong in region b? (1)

6

If a student is selected at random, find the probability that the student

(ii) studies Latin only? (1)

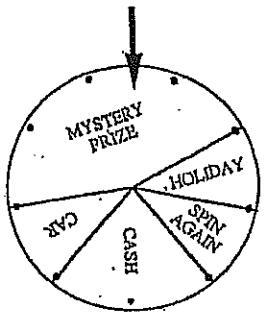
$\frac{8}{35}$

(iii) does not study Latin? (1)

$\frac{21}{35} = \frac{3}{5}$

Marks

5. (1)



When Gilda won a game show she spun a wheel to determine her prize.

What is the probability that Gilda will win a mystery prize in one spin?

$\frac{4}{9}$

6. Two dice are rolled. Find the probability of the sum of the numbers being less than 10. (2)

#1 / #2	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

$P(<10) = 1 - \frac{6}{36} = \frac{5}{6}$

Part C - Consumer Arithmetic (12 marks)

Marks

1. A builder quoted $18250 to complete some renovations requested by a homeowner. This included 10% GST. Calculate the GST. (1)

10% = 18250

10% = $1659.09

2. The following table shows the monthly repayments on a $1000 loan for different interest rates and different terms (number of years).

Annual interest rate	10 years	15 years	20 years	25 years
5%	$10.61	$7.91	$6.60	$5.85
5.25%	$10.73	$8.04	$6.74	$5.99
5.5%	$10.85	$8.17	$6.88	$6.14
5.75%	$10.98	$8.30	$7.00	$6.29
6.00%	$11.10	$8.44	$7.16	$6.44

Jackson wants to take out a loan of $450,000 at an annual interest rate of 5.5%.

(i) What would be Jackson's monthly repayments on this loan over a 20 year term? (1)

450 x 6.88 $3096

(ii) What total amount would Jackson repay over the 20 year term? (1)

3096 x 20 x 12 = $743040

(iii) How much interest would be charged on Jackson's loan over the 20 year term? (1)

743040 - 450000 = $293040

(iv) How much interest would Jackson save if he repaid his loan over 15 years instead of 20 years? (The same 5.5% interest rate applies). (2)

Total repaid = 8.17 x 450 x 15 x 12 = $661770

Interest savings = 743040 - 661770 = $81270

Marks

3. Thomas borrows $15000 to buy a new car. A flat rate of interest is charged at 9.6% p.a. for 4 years. He repays the loan plus interest in equal monthly payments. Calculate the monthly repayments. (2)

$S.I. = \frac{15000 \times 9.6 \times 4}{100}$ $\quad$ Monthly $= \frac{15000 + 5760}{48}$

$= 5760$ $\quad$ $= \$432.50$

4. Ross buys a new car for $46000. Find the depreciated value after 4 years if its value depreciates at the rate of 18% p.a. (1)

$\text{Value} = 46000\left(1 - \frac{18}{100}\right)^4$

$= \$20797.60$

5. Petra's hourly rate of pay is $42.80. During a particular week, she is paid for 25 normal hours, 4 hours at time-and-a-half and 2 hours at the double time rate. Find her total pay for the week. (1)

$25 \times 42.80 + 4 \times 1\frac{1}{2} \times 42.80 + 2 \times 2 \times 42.80$

$= \$1498$

6. Sam invested $2000 at 8% pa to be compounded annually.

(i) What is the value of his investment after 5 years? (1)

$A = 2000\left(1 + \frac{8}{100}\right)^5$

$= \$2938.66$

(ii) Sam needs to have $4000 at the end of 5 years. What interest rate compounded annually would give him this amount? Give your answer correct to one decimal place. (2)

$4000 = 2000\left(1 + \frac{r}{100}\right)^5$

$2 = \left(1 + \frac{r}{100}\right)^5$

$\sqrt[5]{2} = 1 + \frac{r}{100}$

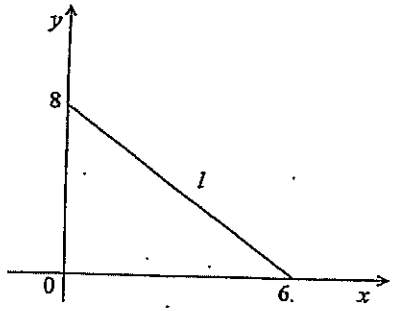
$\frac{r}{100} = \sqrt[5]{2} - 1$

$r = 14.9\%$

Part D - Number Plane (12 marks)

Marks

1. (1)



What is the equation of the line l in gradient intercept form?

$y = -\frac{8}{6}x + 8$

$y = -\frac{4}{3}x + 8$

2. The lines $2x - 3y - 11 = 0$ and $3x + 2y + 29 = 0$ intersect at $(-5, y)$. (1)

Find the value of y. $2x - 5 - 3y - 11 = 0$

$-10 - 3y - 11 = 0$

$3y = -21$

$y = -7$

3. Find the distance between (-2, 3) and (5, 6) as a surd. (1)

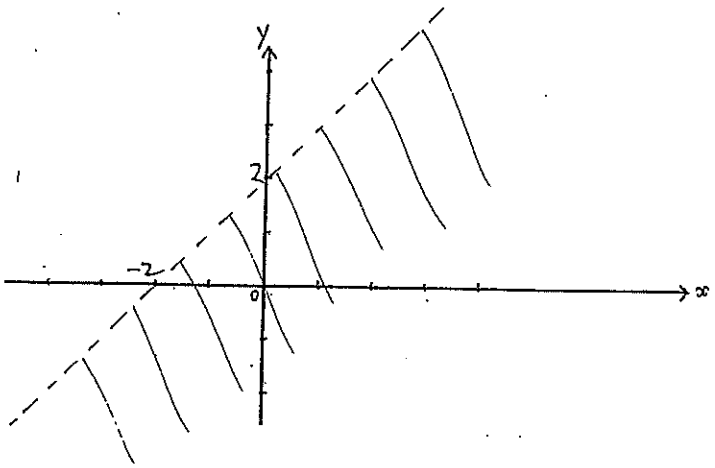
$d = \sqrt{(5 - -2)^2 + (6 - 3)^2}$

$= \sqrt{49 + 9}$

$= \sqrt{58}$

Marks

4. On the number plane below, shade the region represented by $y < x + 2$ (2)



5. The point $(1, 2)$ is the midpoint of $A(-2, 4)$ and $B(x, y)$. Find the coordinates of B. (2)

$\frac{-2+x}{2} = 1$ $\quad \frac{4+y}{2} = 2$

$-2 + x = 2$

$(4, 0)$

6. Find the equation of the straight line which passes through the point (4, -3) and is parallel to the line $x - 2y - 10 = 0$. Give your answer in general form. (3)

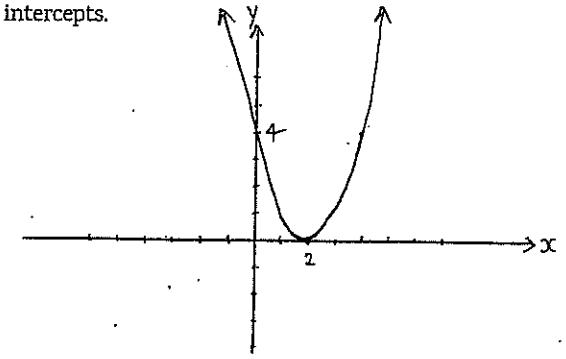
$2y = x - 10$

$y = \frac{1}{2}x - 5 \quad \therefore m = \frac{1}{2}$

$y - -3 = \frac{1}{2}(x - 4)$

$2y + 6 = x - 4$ $\quad x - 2y - 10 = 0$

7. Sketch $y = (x - 2)^2$ on the number plane below showing the vertex and any x and y intercepts. (2)



Part E - Miscellaneous (12 marks)

Marks

1. Luke works a 40 hour week at a fixed hourly rate. He receives a holiday loading that is 17½% of four weeks pay. His holiday loading last year was $602. What was his hourly rate of pay? (2)

$\$602 = 17\frac{1}{2}\%$ for 4 weeks $\quad \therefore$ Hourly

$\$150.5 = 17\frac{1}{2}\%$ for 1 week $\quad = \frac{860}{40}$

$\$8.60 = 1\%$ for 1 week

$\$860 = 100\%$ for 1 week $\quad = \$21.50$

2. For the parabola $y = -x^2 + 6x - 8$ find:

(i) the x intercepts (2)

$y = 0$

$0 = -x^2 + 6x - 8$

$0 = x^2 - 6x + 8$ $\quad \therefore x = 2$ or 4

$0 = (x - 2)(x - 4)$ $\quad$ OR $(2, 0)$ $(4, 0)$

(ii) the y intercept (1)

$y = -8$ $\quad$ OR $\quad (0, -8)$

(iii) the coordinates of the vertex (1)

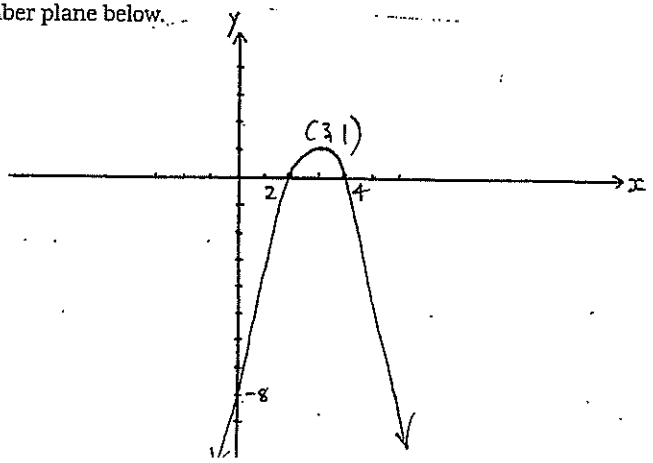
at $x = 3$

$y = -9 + 18 - 8$

$y = 1$

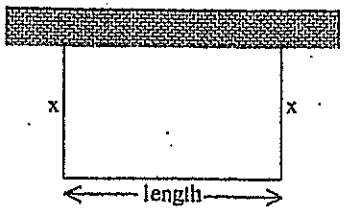
$(3, 1)$

(iv) Show all of the above on a graph of the parabola on the number plane below. (1)



Marks

3. A rectangular garden is to have a wall on one side. It has fencing around the other three sides.



(i) If the gardener has 25m of fencing, write an expression for the length of the garden in terms of x. (1)

$2x + \text{length} = 25$

$l = 25 - 2x$

(ii) If the area of the garden is 75m², write an equation in terms of x connecting the length, width and area of the field, (1)

$A = 75 = x(25 - 2x)$

(iii) Solve your equation in part (ii) to find the possible dimensions of the field. (3)

$75 = 25x - 2x^2$

$2x^2 - 25x + 75 = 0$

$(2x - 15)(x - 5) = 0$

$x = 5$ or 7.5

$l = 15$ or 10

∴ Possible dimensions are

5×15 or 7.5×10