Name: ..... Maths Class: .....

SYDNEY TECHNICAL HIGH SCHOOL

Year 10
Mathematics

Common Test

Assessment 2

May, 2018

Time allowed: 70 minutes

General Instructions:

- Marks for each question are indicated on the question.
- Approved calculators may be used
- All necessary working should be shown
- Full marks may not be awarded for careless work or illegible writing
- Write using black or blue pen
- Write your answers in the space provided

Multiple choice	/5
Question 1	/12
Question 2	/12
Question 3	/12
Question 4	/12
Question 5	/12
TOTAL	**/65**

Section 1 Multiple Choice (5 marks)

Colour the bubble of the correct answer on your multiple choice answer sheet in your answer booklet

1. Matthew earns \$22.50 per hour for a 38-hour work week, time-and-a-half for the next 3 hours, and double time after that. How much does he get paid for a 45-hour work week?

   A. \$1012.50

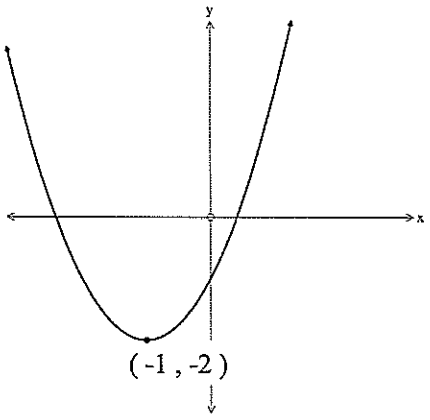
   B. \$1170

   C. \$2025

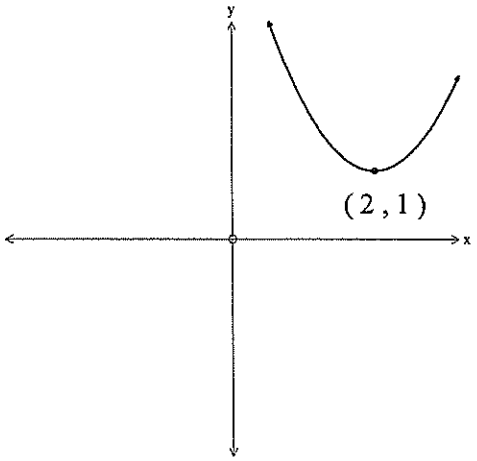
   D. \$1136.25

2. Which of these graphs has the equation $y = (x - 2)^2 + 1$

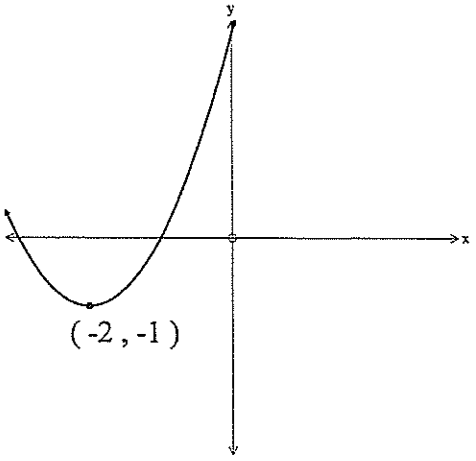
A.



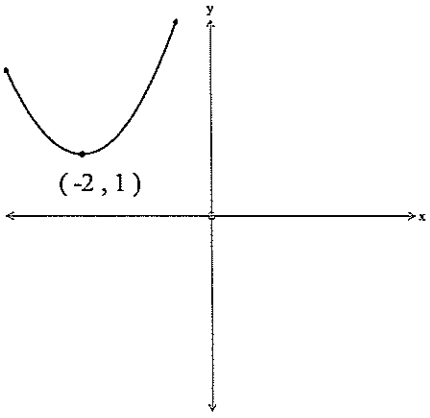
B.



C.



D.



3. Alice, Bob, Carol, Dan, and Erin stand in a line. If Erin must be at the front of the line, how many possible arrangements are there?

A. 120

B. 5

C. 24

D. 96

4. The equation $24x = 3x^2 + 48$ has:

A. No real solutions

B. Exactly one solution

C. Two solutions

D. At least one solution

5. The solutions to $(3x + 2)(5x - 1) = 0$ are:

A. $x = -2$ or $x = 1$

B. $x = -\frac{2}{3}$ or $x = \frac{1}{5}$

C. $x = -\frac{3}{2}$ or $x = 5$

D. $x = \frac{2}{3}$ or $x = -\frac{1}{5}$

Section 2 (60 marks)

All answers are to be completed in your answer booklet. Show all necessary working

Question 1 (Start a New Page) **(12 marks)**

a) For the points A: (2,5) and B: $(3,-1)$, find:

i) The distance of the line AB (to two decimal places). **1**

ii) The midpoint of AB. **1**

iii) The gradient of AB. **1**

b) The table below shows the monthly repayments of on a \$100 000 loan for different interest rates and different terms (number of years).

Annual Interest Rate	Term of Loan		
	15 years	**20 years**	**25 years**
7%	\$899	\$775	\$707
7.5%	\$927	\$806	\$739
8%	\$956	\$836	\$772
8.5%	\$985	\$868	\$805
9%	\$1014	\$900	\$839

Sarah wants to take out a loan of \$500 000 at an annual interest rate of 8%.

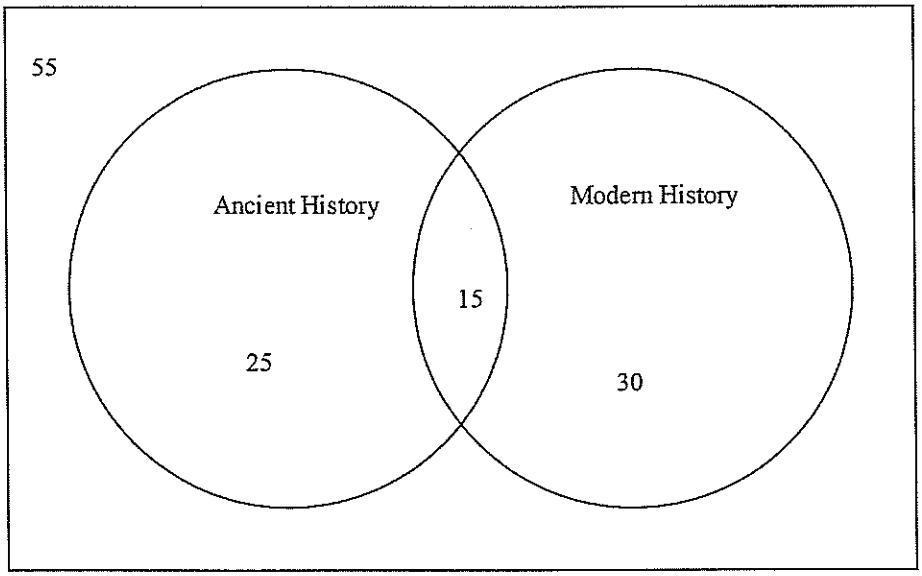
i) What would be Sarah's monthly repayment on this loan over a 15-year term? **2**

ii) What total amount would Sarah repay over the 15-year term? **1**

iii) What percentage of Sarah's total repayment would be interest? (Answer to the nearest percent) **2**

c) In words, what is the complement of rolling a 5 on a six-sided die? **1**

d) The Venn diagram below represents how students selected history subjects in Year 11.



For a randomly selected student, what is the probability that:

i) They selected neither history subject? **1**

ii) They selected ancient history? **1**

iii) They selected exactly one history subject? **1**

Question 2 (Start a New Page) **(12 marks)**

a) Solve, leaving answers as an exact value if necessary (show all working):

i) $8b^2 - 10b + 3 = 0$ **2**

ii) $(12y + 1)^2 = 13$ **2**

b) Is the parabola $y = 5x + 3 - 2x^2$ concave up or concave down? **1**

c) Last financial year, John earned a salary of \$93 000, as well as \$5500 through investments. John's tax deductions totalled \$3350, and he paid \$26 400 in PAYG tax. Answer the following with reference to the tax table below.

Income	Marginal tax rate	Tax payable
\$0-\$18,200	0%	Nil
\$18,201- \$37,000	19%	19 cents for each \$1 over \$18,200
\$37,001-\$87,000	32.5%	\$3,572 plus 32.5 cents for each dollar over \$37,000
\$87,001-\$180,000	37%	\$19,822 plus 37 cents for each dollar over \$87,000
\$180,001 and above	45%	\$54,232 plus 45 cents for each dollar over \$180,000

i) What is John's taxable income? **1**

ii) Calculate the 2% Medicare Levy that John must pay. **1**

iii) Including the Medicare Levy, evaluate John's tax payable. **2**

iv) At the end of the financial year, John will either owe tax or receive a refund. Does he owe the tax office, or does the tax office owe him, and how much money is owed? **1**

d) For the line $y = -\frac{3}{4}x + 5$.

i) What is the gradient and y-intercept of the line? **1**

ii) Rewrite the equation of the line in general form. **1**

Question 3 (Start a New Page) **(12 marks)**

a) Tom and Jerry both invest \$15 000 over five years. Tom's investment earns simple interest at $12\%\ p.\ a.$ where Jerry's earns compounding interest at 9% p.a., compounding monthly.

i) How much interest did Tom's investment earn? **1**

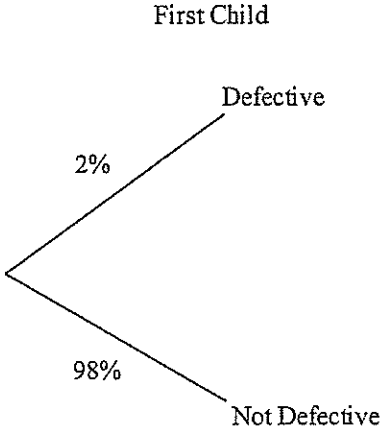
ii) How much interest did Jerry's investment earn? **2**

iii) Find the equivalent simple rate (to one decimal place) of simple interest for the compound interest Jerry earned over the five years. **2**

b) Find the equation of the line perpendicular to $y = 3x + 2$, which passes the point $(-2, -1)$. **2**

c) In a large sample of computers, it is found that 2% have a defect. Caleb buys each of his three children one of these computers.

i) To represent this situation, copy and complete the tree diagram below in your answer booklet. **1**



ii) What is the probability that none of Caleb's children have defective computers? (Answer as a percentage to one decimal place) **1**

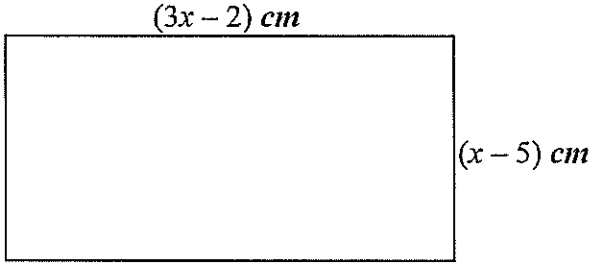
iii) What is the probability that only Caleb's oldest child has a defective computer? (Answer as a percentage to one decimal place) **1**

iv) What is the probability that exactly two of Caleb's children have defective computers? (Answer as a percentage to one decimal place) **2**

Question 4 (Start a New Page) **(12 marks)**

a) Jo buys a car, which depreciates in value by 15% each year. After 7 years, it is worth \$5193.35. How much did Jo originally pay for the car? **2**

b) The area of this rectangle is 16 cm^2.



i) Write an equation representing the area of the rectangle. **1**

ii) Find all possible values of x **2**

iii) Evaluate the perimeter of the rectangle **1**

c) For the curve $y = x^2 - 2x - 8$

i) Find the x and y intercepts. **2**

ii) Find the coordinates of the vertex **2**

iii) Sketch the graph, showing all important features **2**

Question 5 (Start a New Page) **(12 marks)**

a) Solve the quadratic equation $\frac{5}{x} = \frac{2x}{1-x}$ (leave your answer as an exact value). **3**

b) Two cards are drawn from a standard deck of 52 cards, without replacement. What is the probability of drawing

i) A red card each time? **1**

ii) Two aces? **1**

iii) A prime number each time?
Note: Picture cards (Jack, King, and Queen), do not count as numbers. **1**

iv) At least one spade? **1**

c) Steve is planning on purchasing a \$18 000 car, with the option to borrow from a car dealer or the bank. With the car dealer, Steve must provide a 10% deposit and then pay flat rate interest of 8% $p.a.$ on the remaining balance over 3 years. The bank offers Steve a reducible interest loan which results in monthly repayments of \$560 over 3 years.

i) Calculate the total amount paid with the car dealer. **2**

ii) Calculate the total amount paid with the bank. **1**

iii) Which was the better offer and by how much? **2**

Multiple Choice

1. D, 2. B, 3. C, 4. B, 5. B

Section 2

1. a) i) $d = \sqrt{(3-2)^2 + (-1-5)^2}$
$= \sqrt{1+36}$
$= \sqrt{37}$ units
$= 6.08$ (2dp)

ii) $M = \left(\frac{2+3}{2}, \frac{5+(-1)}{2}\right)$
$= \left(\frac{5}{2}, 2\right)$

iii) $m = \frac{-1-5}{3-2}$
$= -6$

b) i) $\$956 \times 5$
$= \$4780$

[1 for reading off table
1 for multiplying by 5]

ii) $\$4780 \times 15 \times 12$
$= \$860\,400$

[1 for interest
1 for percent]

iii) Interest $= \$860400 - \$500000$
$= \$360\,400$

Interest as percentage of repayment:

$\frac{360400}{860400} \times 100 = 42\%$ (nearest percent).

c) Not rolling a 5 or rolling a 1, 2, 3, 4, or 6.

d) i) $\frac{55}{55+25+15+30}$
$= \frac{55}{125}$
$= \frac{11}{25}$

ii) $\frac{25+15}{125}$
$= \frac{8}{25}$

iii) $\frac{25+30}{125}$
$= \frac{11}{25}$

2. a) i) $8b^2 - 10b + 3 = 0$
$8b^2 - 6b - 4b + 3 = 0$
$2b(4b-3) - (4b-3) = 0$
$(2b-1)(4b-3) = 0$
$b = \frac{1}{2}$ or $b = \frac{3}{4}$

[1 for factorization (or progress)
1 for answer]

ii) $(12y+1)^2 = 13$
$12y + 1 = \pm\sqrt{13}$
$y = \frac{-1 \pm \sqrt{13}}{12}$

[1 for taking square root
1 for answer]

b) Concave down

c) i) $93 000 + $5500 − $3350
= $95150

ii) 0·02 × $95150
= $1903

iii) Tax: $19 822 + 0·37 × ($95150 − $87000)
= $22 837·50

Total: $22837·50 + $1903
= $24 740·50

[1 for tax
1 for total]

iii) $26 400 − $24 740·50
= $1659·50

∴ John is owed $1659·50

d) i) Gradient: $m = \frac{-3}{4}$

y-intercept: (0, 5)

ii) $y = \frac{-3}{4}x + 5$
$4y = -3x + 20$
$3x + 4y - 20 = 0$

3. a) i) $I = 15000 \times 0{\cdot}12 \times 5$
= $9000

ii) $A = 15000\left(1 + \frac{0{\cdot}09}{12}\right)^{5\times12}$
= $23 485·22

[1 for formula
1 for interest]

Interest = $23 485·22 − $15 000.
= $8485·22

iii) $8485·22 = 15000 × R × 5
R = 11·3% p.a.

[1 for formula
1 for answer]

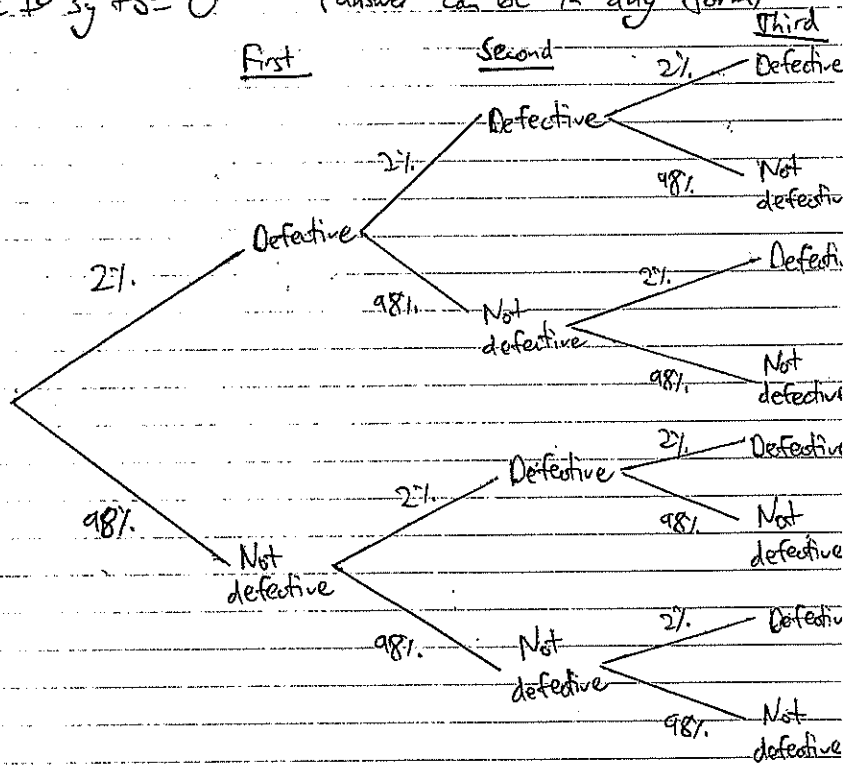
b) $m = -\frac{1}{3}$

[1 for gradient
1 for answer]

$y - y_1 = m(x - x_1)$
$y + 1 = -\frac{1}{3}(x + 2)$
$3y + 3 = -x - 2$
$x + 3y + 5 = 0$

(answer can be in any form)

c) i)



ii) $(0{\cdot}98)^3 = 94{\cdot}1\%$ (1 dp)

iii) $0{\cdot}02 \times 0{\cdot}98 \times 0{\cdot}98 = 1{\cdot}9\%$ (1 dp)

iv) $0{\cdot}02 \times 0{\cdot}02 \times 0{\cdot}98 \times 3 = 0{\cdot}1\%$ (1 dp)

1 if they forget (×3)

4.

a) $5193.35 = P(1-0.15)^7$ [1 for formula, 1 for answer]

$P = \frac{5193.35}{0.85^7}$

$= \$16200.00$

b) i) $(3x-2)(x-5) = 16$ | $(3x-2)(x-5)$ is accepted.

ii) $3x^2 - 15x - 2x + 10 = 16$ [1 for factorisation or progress; 1 for answer including negative value removed]

$3x^2 - 17x - 6 = 0$

$3x^2 - 18x + x - 6 = 0$

$3x(x-6) + (x-6) = 0$

$(3x+1)(x-6) = 0$

$x = \cancel{-\frac{1}{3}}$ or $x = 6$

$\therefore x = 6$ only

iii) Perimeter $= 2(3x6-2) + 2(6-5)$

$= 2 \times 16 + 2 \times 1$

$= 34$ cm

b) $y = x^2 - 2x - 8$ [1 for x-ints, 1 for y-int]

i) y-intercept: $(0, -8)$

If $y = 0$: $x^2 - 2x - 8 = 0$

$(x-4)(x+2) = 0$

$x = 4$, or $x = -2$

$\therefore$ x-intercepts are $(4,0)$ and $(-2,0)$

ii) Axis of symmetry $x = \frac{4+(-2)}{2}$

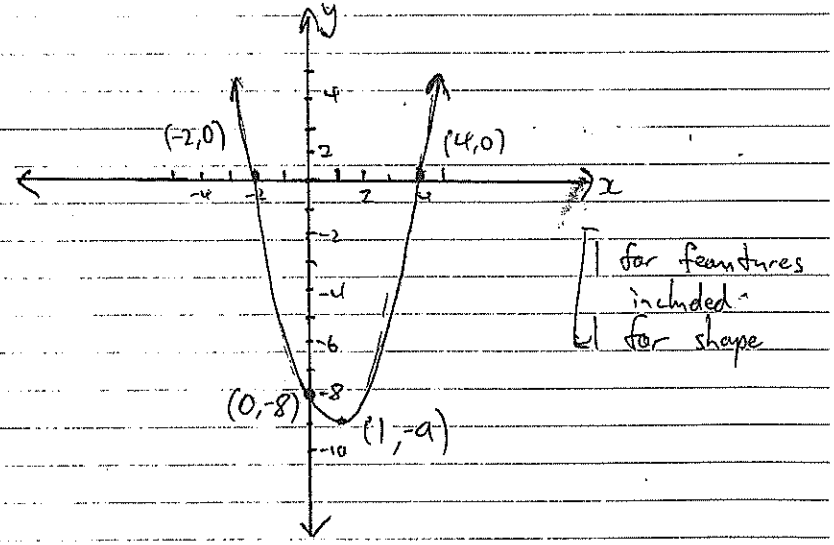
$= 1$ [1 for axis (or x-value), 1 for vertex]

$\therefore y = 1 - 2 - 8$

$= -9$

$\therefore$ Vertex is $(1, -9)$

iii)



[1 for features included; 1 for shape]

5. a) $\frac{5}{x} = \frac{2x}{1-x}$

$5 - 5x = 2x^2$

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

$x = \frac{-5 \pm \sqrt{5^2 - 4 \times 2 \times (-5)}}{2 \times 2}$

$= \frac{-5 \pm \sqrt{65}}{4}$

1 for removing fraction
1 for progress (eg. putting into formula)
1 for answer

b) i) $\frac{1}{2} \times \frac{25}{51}$

$= \frac{25}{102}$

ii) $\frac{1}{13} \times \frac{3}{51}$

$= \frac{1}{221}$

iii) 2, 3, 5, 7 2, 3, 5, 7 2, 3, 5, 7 2, 3, 5, 7

$\therefore P(\text{prime each time}) = \frac{16}{52} \times \frac{15}{51}$

$= \frac{20}{221}$

iv) $P(\text{no spades}) = \frac{3}{4} \times \frac{38}{51}$

$= \frac{19}{34}$

$\therefore P(\text{at least one spade}) = 1 - \frac{19}{34}$

$= \frac{15}{34}$

c) i) Deposit: \$18000 × 10%

= \$1800

Borrowed: \$18000 − \$1800

= \$16200

1 for recognising the deposit
1 for answer

$\therefore$ Total paid: \$1800 + \$16200 × 8% × 3 + \$16200

= \$21888

ii) Total paid = \$560 × 12 × 3

= \$20160

iii) \$21888 − \$20160

= \$1728

$\therefore$ The bank is better by \$1728

1 for which is better
1 for amount