Sydney Technical High School

Name: .....

Maths Class: .....

Year 10

Mathematics

Assessment 2

Term 2

May, 2021

Time allowed: 90 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
- ***Begin each question on a new page***
- Write using black or blue pen
- All answers are to be in the writing booklet provided

Section 1 Multiple Choice
Questions 1-6
6 Marks

Section II Questions 7-11
64 Marks

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Section 1 Multiple Choice (6 marks)

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

1. Which of the following is the factorised form of $x^2 + 2x$?

   A. $2x(x + 1)$

   B. $x(x + 2)$

   C. $x(x^2 + 2)$

   D. $2(x^2 + 2)$

2. Solve $x(x - 3) = 0$

   A. $x = 0 \; or \; x = -3$

   B. $x = 3$

   C. $x = 0 \; or \; x = 3$

   D. $x = \pm 3$

3. What is the gradient of a horizontal line?

   A. 1

   B. -1

   C. undefined

   D. 0

4. Solve $y^2 = 62$

   A. $y = 8$

   B. $y = \pm 8$

   C. $y = \sqrt{62}$

   D. $y = \pm\sqrt{62}$

5. The points A and B have a midpoint of $(4, 6)$. If A is the point $(3, 5)$, what are the coordinates of B?

   A. $(5, 7)$

   B. $(3, 6)$

   C. $(3.5, 5.5)$

   D. $(2, 4)$

6. Two coins are flipped. What is the probability of getting two tails?

A. 0

B. -0.25

C. 1

D. 0.25

Section 2 (64 marks)

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

Question 7 (Start a New Page) **(13 marks)**

a) Fully factorise

i. $-6y - 24y^3$ **1**

ii. $9x^2 - 64$ **1**

iii. $5(a + 3) - b(a + 3)$ **1**

iv. $3x^2 - 6xy + 4x - 8y$ **1**

v. $(x - 1)(y + 4) - (y + 4)(3 + 2x)$ **2**

vi. $3x^2 - 12x + 12$ **2**

b) Fully simplify $\frac{2}{3x} - \frac{1}{2x}$ **1**

c) Fully simplify $\frac{x^2-81}{x+9}$ **2**

d) Solve $x^2 - 3x - 10 = 0$ **2**

End of Question 7

Question 8 (Start a New Page) **(13 marks)**

a) 60 people were surveyed to see which team was more popular, Manchester United or Liverpool. 24 people surveyed said they like both, 14 people like only Liverpool and 5 people did not like either. And the Venn diagram below shows all the information.



i. Redraw the two way table below in your answer booklet and represent information. **2**

	Likes Liverpool	Dislikes Liverpool	Total
Likes Man United			
Dislikes Man United			
Total			

Calculate the following probabilities if one person chosen at random from the group

ii. P (likes Liverpool but not Manchester United) **1**

iii. P (likes Manchester United only) **1**

iv. P (likes either Liverpool or Manchester United) **1**

b) Given the points $A\ (-1, 2)$ and $B\ (4, 6)$, find

i. The distance of the line AB **1**

ii. The gradient of the line AB **1**

iii. The equation of the line AB, leaving your answer in the form **2**

$y = mx + b$

c) The line $2x - 3y + 6 = 0$ passes through the point $(b, 2)$, find the value of b. **2**

d) Convert $y = -\frac{1}{2}x + 5$ into general form. **2**

End of Question 8

Question 9 (Start a New Page) **(13 marks)**

a) Consider the line $y = 3x - 1$

i. Find the y- intercept **1**

ii. Find the x- intercept **1**

iii. Using at least $\frac{1}{3}$ of a page of your booklet, make a neat sketch of **2**

$y = 3x - 1$, clearly labelling all features above.

b) Two cards are drawn from a standard deck. What is the probability of getting two hearts if the cards are drawn and the first card is:

i. Replaced **1**

ii. Not replaced **1**

c) The area of a rectangle is given by $A = 3y^2 + 12y^3$.

i. If one dimension is $3y$, what is the other dimension of the rectangle? **1**

ii. Find the dimensions of this rectangle if $y = 3\ cm$ **1**

iii. Find the value of y for which the rectangle is a square. **1**

d) Solve for x and y by the method of substitution **2**

$$x = 2y + 1$$

$$2x - y = 9$$

e) Find the number of real solutions of $5x^2 + 7x + 4 = 0$ using the discriminant. **2**

End of Question 9

Question 10 (Start a New Page) **(13 marks)**

a) Solve $3x^2 - 14x - 5 = 0$ by the quadratic formula **2**

b) Fully simplify $\frac{a^2}{a^2+2a-8} + \frac{2a}{a-2}$ **3**

c) i. Express $x^2 - 6x - 11$ in the form $(x - a)^2 + b$ **2**

ii. Hence solve $x^2 - 6x = 11$. Leave your answer in exact form. **1**

d) The tension (h Newtons) of an elastic string is given by $h = x^2 - 40x$, where x is the surface area of the string (in m^2) .

i. Find the value(s) of x when $h = 0$ and $x > 0$ **1**

ii. Find the surface area of the string if the tension is 500 Newtons **2**

e) Given $\frac{2x-y}{4x+3y} = \frac{4}{3}$, find the value of $\frac{x}{y}$ **2**

End of question 10

Question 11 (Start a New Page) **(12 marks)**

a) Solve $8x^4 + 2x^2 - 3 = 0$ **3**

b) Two dice are rolled and then two numbers are added together to give a score. Find the probability that

i. The score is even **1**

ii. The score is at least 8 **1**

iii. The score is less than 7 given that one of the numbers is 4 **2**

c) 2 cards are chosen at random, without replacement, from a standard 52-deck of playing cards. Find the probability of choosing at least 1 heart. **2**

d) Peter and Mary compete in a series of games. The series finishes when one player has won 3 games. In any game, the probability that Peter wins is $\frac{2}{3}$ and the probability that Mary wins is $\frac{1}{3}$.

Find the probability that Peter wins the series by the end of the fourth game. **3**

End of examination

Q1

$x^2 + 2x$

$= x(x+2)$

B

Q2 $x = 0$ or $x = 3$

C

Q3 D

Q4 D

Q5 A

Q6 D

Q7 (a)(i) $-6y(1 + 4y^2)$

(a)(ii) $(3x + 8)(3x - 8)$

(a)(iii) $(5 - b)(a + 3)$

(a)(iv) $3x^2 - 6xy + 4x - 8y$

$= 3x(x - 2y) + 4(x - 2y)$

$= (3x + 4)(x - 2y)$

(a)(v) $(y+4)(x - 1 - (3 + 2x))$

$= (y+4)(x - 1 - 3 - 2x)$

$= (y+4)(-4 - x)$

$= -(y+4)(x+4)$

(a)(vi) $3(x^2 - 4x + 4)$

$= 3(x-2)^2$

(b) $\frac{2}{3x} - \frac{1}{2x}$

$= \frac{4 - 3}{6x}$

$= \frac{1}{6x}$

(c) $\frac{x^2-81}{x+9}$

$= \frac{(x-9)(x+9)}{x+9} = x-9$

(d) $x^2 - 3x - 10 = 0$

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

$x = 5$ or $x = -2$

8(a)(i)

	Likes Liverpool	✗ Liverpool	Total
Likes Man United	24	17	41
✗ Man United	14	5	19
Total	38	22	60

(a)(ii) $\frac{14}{60}$

$= \frac{7}{30}$

(a)(iii) $\frac{17}{60}$

(a)(iv) $\frac{55}{60}$

$= \frac{11}{12}$

(b) (i)

$$AB = \sqrt{(6-2)^2 + (4+1)^2}$$

$$= \sqrt{16+25}$$

$$= \sqrt{41} \text{ units}$$

(ii) $$m_{AB} = \frac{6-2}{4+1}$$

$$= \frac{4}{5}$$

(iii) $$\frac{y-y_1}{x-x_1} = \frac{4}{5}$$

$$\frac{y-6}{x-4} = \frac{4}{5}$$

$$y - 6 = \frac{4}{5}x - \frac{16}{5}$$

$$y = \frac{4}{5}x + \frac{14}{5}$$

(c) $$2x - 3(2) + 6 = 0$$

$$x = 0$$

So $b = 0$

(d) $$y = -\frac{1}{2}x + 5$$

$$2y = -x + 10$$

$$x + 2y - 10 = 0$$

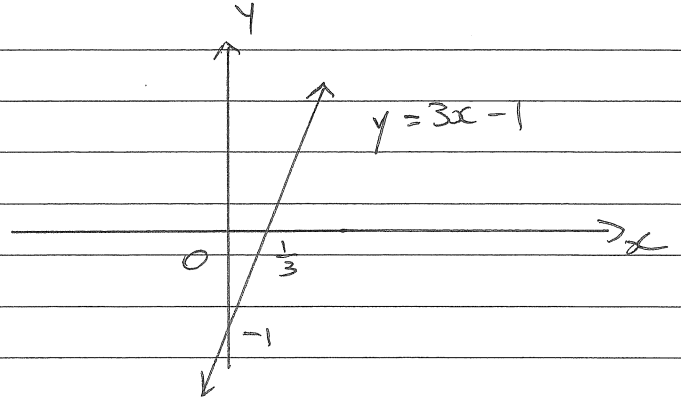
Q9 (a) (i) $(0, -1)$

(a) (ii) Put $y = 0$, $0 = 3x - 1$

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

$$\left(\frac{1}{3}, 0\right)$$

(a) (iii)



(b) (i) $\frac{1}{16}$

(b) (ii) $$\frac{13}{52} \times \frac{12}{51}$$

$$= \frac{13}{13} \times \frac{3}{51}$$

$$= \frac{3}{51}$$

$$= \frac{1}{17}$$

(c) (i) $\frac{3y^2 + 12y^3}{3y}$

$= \frac{3y(y + 4y^2)}{3y}$

$= y + 4y^2$

(c) (ii) $3 + 4(3)^2 = 39$

Dimension = 9 cm × 39 cm

(c) (iii)

$3y = y + 4y^2$

$0 = 4y^2 - 2y$

$0 = 2y(2y - 1)$

$y = 0$ or $y = \frac{1}{2}$

Answer : $y = \frac{1}{2}$

(d) $x = 2y + 1$ ... (1)

$2x - y = 9$ ... (2)

$2(2y + 1) - y = 9$

$4y + 2 - y = 9$

$3y = 7$

$y = \frac{7}{3}$

$x = 2\left(\frac{7}{3}\right) + 1$

$x = \frac{14}{3} + 1$

$x = \frac{17}{3}$

Answer : $x = \frac{17}{3}$, $y = \frac{7}{3}$

(e) $\Delta = 7^2 - 4(4)(5)$

$= 49 - 80$

$= -31 < 0$

So No real solutions

Q10 (a)

$$x = \frac{14 \pm \sqrt{14^2 - 4(3)(-5)}}{6}$$

$$x = \frac{14 \pm \sqrt{196 + 60}}{6}$$

$$x = \frac{14 \pm \sqrt{256}}{6}$$

$$x = \frac{14 \pm 16}{6}$$

$$x = \frac{30}{6} \text{ or } x = \frac{-2}{6}$$

$$x = 5 \text{ or } x = -\frac{1}{3}$$

(b)

$$\frac{a^2}{a^2+2a-8} + \frac{2a}{a-2}$$

$$= \frac{a^2}{(a+4)(a-2)} + \frac{2a}{a-2}$$

$$= \frac{a^2 + 2a(a+4)}{(a+4)(a-2)}$$

$$= \frac{a^2 + 2a^2 + 8a}{(a+4)(a-2)}$$

$$= \frac{3a^2 + 8a}{(a+4)(a-2)}$$

(c) (i) $x^2 - 6x - 11$

$= (x^2 - 6x + 9) - 11 - 9$

$= (x-3)^2 - 20$

(c) (ii) $x^2 - 6x = 11$

$(x-3)^2 = 20$

$x - 3 = \pm\sqrt{20}$

$x - 3 = \sqrt{20}$ or $x - 3 = -\sqrt{20}$

$x = 3 + 2\sqrt{5}$ or $x = 3 - 2\sqrt{5}$

(d) (i)

$0 = x^2 - 40x$

$0 = x(x - 40)$

$x = 0$ or $x = 40$

Answer : $x = 40$

(d) (ii) $x^2 - 40x = 500$

$x^2 - 40x - 500 = 0$

$(x - 50)(x + 10) = 0$

$x = 50$ or $x = -10$

But surface area cannot be negative

so Answer: surface area $= 50\ m^2$

Student Name: _____ Teacher Name: _____

(e)

$$\frac{2x-y}{4x+3y} = \frac{4}{3}$$

$$6x - 3y = 16x + 12y$$

$$-10x = 15y$$

$$\frac{x}{y} = -\frac{15}{10}$$

$$\frac{x}{y} = -\frac{3}{2}$$

Student Name: _____ Teacher Name: _____

Q11

(a) $8(x^2)^2 + 2(x^2) - 3 = 0$

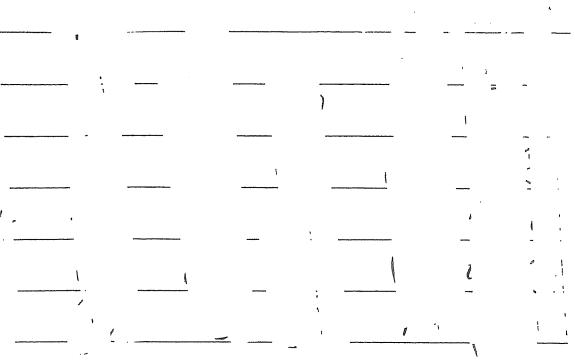
$(2x^2 - 1)(4x^2 + 3) = 0$

$2x^2 = 1$ or $4x^2 = -3$ (rejected)

$x^2 = \frac{1}{2}$

$x = \pm\sqrt{\frac{1}{2}}$

(b)



(i) $\frac{1}{2}$

(ii) $\frac{15}{36} = \frac{5}{12}$

(iii) $P(A|B) = \frac{|A \cap B|}{|B|}$

$= \frac{4}{11}$

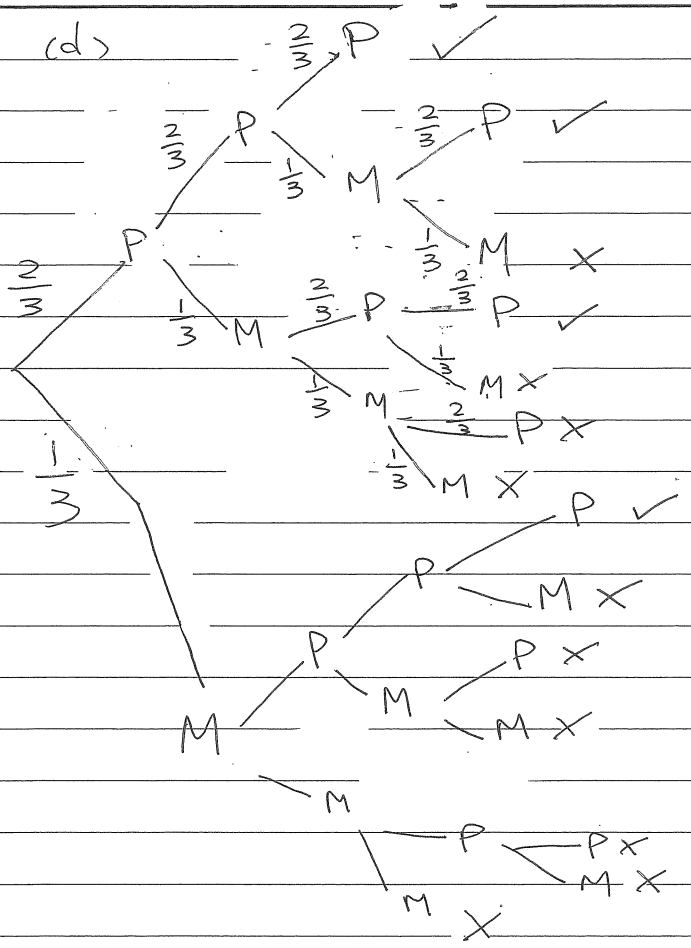
(c) $P(1 \text{ heart}) + P(2 \text{ hearts})$

$= \frac{1}{4} \times \frac{12}{51} \times 2 + \frac{1}{4} \times \frac{12}{51}$

$= \frac{3}{17}$

Student Name: _____ Teacher Name: _____

(d)



$$\left(\frac{2}{3}\right)^3 + \left(\frac{2}{3}\right)^3\left(\frac{1}{3}\right) \times 3$$

$$= \frac{16}{27}$$

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