ST ALOYSIUS' COLLEGE

2017
Yearly Examination
Year 9 Stage 5.3
MATHEMATICS

Name: SOLUTIONS

Teacher: IMO GON MCR PLU

- Record your multiple choice answers by filling in the circle corresponding to your choice for each question.
- Fill in the circle completely.
- Each question has only one correct answer.

Question 1
A ○ B ○ C ○ D ●

Question 2
A ○ B ○ C ● D ○

Question 3
A ○ B ○ C ● D ○

Question 4
A ○ B ○ C ○ D ●

Question 5
A ● B ○ C ○ D ○

Question 6
A ● B ○ C ○ D ○

Question 7
A ○ B ○ C ● D ○

Question 8
A ○ B ● C ○ D ○

Question 9
A ● B ○ C ○ D ○

Question 10
A ○ B ○ C ● D ○

Question 11
A ○ B ○ C ○ D ●

Question 12
A ○ B ● C ○ D ○

Question 13
A ○ B ● C ○ D ○

Question 14
A ○ B ○ C ● D ○

Question 15
A ○ B ○ C ● D ○

Question 16
A ○ B ● C ○ D ○

Question 17
A ○ B ○ C ● D ○

Question 18
A ○ B ● C ○ D ○

Question19
A ● B ○ C ○ D ○

Question 20
A ○ B ○ C ○ D ●

Question 21
A ○ B ○ C ○ D ●

Question 22
A ○ B ● C ○ D ○

Question 23
A ○ B ○ C ○ D ●

Question 24
A ○ B ○ C ● D ○

Question 25
A ○ B ○ C ● D ○

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TEACHER: **IMO** **GON** **MCR** **PLU**

St Aloysius' College

Year 9

Yearly Examination

2017

MATHEMATICS (5.3 course)

General Instructions

Reading time – 5 minutes

Working time – $1\frac{1}{2}$ hours

- Write using black pen only.
- Board approved calculators may be used
- All necessary working should be shown in every question in the spaces provided.
- Marks will be deducted for careless and poorly arranged work
- Examination papers must NOT be removed from the examination room.

Total marks – 80

Attempt all questions

Section I – Multiple Choice **(20 Marks)**

- All questions are of equal value
- Circle the correct answer on the separate answer sheet

Section II – Short answer **(20 marks)**

Section III – Working required **(40 marks)**

Section I

25 marks
Attempt Questions 1 - 25

Use the multiple-choice answer sheet for Questions 1-25

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1 Which number is the larger?

(A) 0.036 = 0.036
(B) -3.6 = -3.6
(C) 3.6×10^{-1} = 0.36
(D) $3+6^{-1}$ = 3.16

D

2 What is the value of x, if $3x-8=34$?

(A) 6 $3x = 42$
(B) 8 $x = 14$
(C) 14
(D) 27

C

3 Which of the following is the number 495,000,000 expressed in scientific notation?

(A) 0.495×10^{7}
(B) 4.95×10^{-8} 4.95×10^{8}
(C) 4.95×10^{8}
(D) 49.5×10^{7}

C

4 Which of the following will produce an even number if $x=3$?

(A) x^2 $3^2 = 9$
(B) x^2+2 $3^2+2 = 11$
(C) $2x+1$ $2(3)+1 = 7$
(D) x^2+2x+1 $(3)^2+2(3)+1 = 16$

D

5 What is the value of θ if $\cos\theta=0.8$?

(A) 36°52'
(B) 36°87'
(C) 37°
(D) 53°8'

$\theta = \cos^{-1} 0.8$
$\theta = 36°52'$

A

6 What is the probability of throwing two sixes if two dice are thrown?

(A) $\frac{1}{36}$

(B) $\frac{11}{36}$

(C) $\frac{1}{6}$

(D) $\frac{1}{3}$

	1	2	3	4	5	6
1	11	12	13	14	15	16
2	21	22	23	24	25	26
3	31	32	33	34	35	36
4	41	42	43	44	45	46
5	51	52	53	54	55	56
6	61	62	63	64	65	66

$\frac{1}{36}$ A

7 Which graph is perpendicular to $y = 2x + 1$:

(A) $y = -2x + 1$

(B) $y = \frac{1}{2}x + 1$

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

(D) none of these

$m = 2$

$m_{\perp} = -\frac{1}{2}$

C

8 What is the median of the numbers 6, 7, 4, 0, 2 and 6?

(A) 2

(B) 5

(C) 6

(D) 7

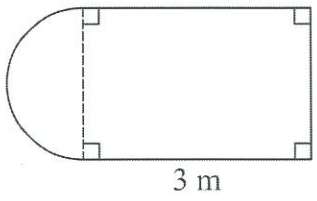
0 2 4 6 6 7

$\frac{4+6}{2}$

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

B

9 A composite shape is made up of a rectangle and a semi-circle.



Not to scale

What is the perimeter of the shape, correct to two decimal places?

(A) 11.14 m

(B) 13.14 m

(C) 14.28 m

(D) 16.28 m

$P = \frac{\pi(2)}{2} + 3 + 3 + 2$

$= 11.14\text{m}$

A

10 What is the simple interest earned when \$5000 is invested at 6% p.a. for 3 years?

(A) \$90

(B) \$100

(C) \$900

(D) \$1000

$5000 \times 0.06 \times 3$

\$900

C

11 Which number is three less than the number $6a-5$?

(A) $-3a$
(B) $3a-2$
(C) $3a-5$
(D) $6a-8$

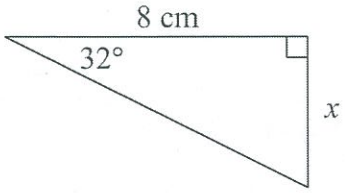
$6a-5-3$
$6a-8$
D

12 Hayley's hourly rate of pay is \$15.20 for the first 36 hours and time-and-a-half for every extra hour. How much is she paid for 45 hours of work?

(A) \$684.00
(B) \$752.40
(C) \$820.80
(D) \$1026.00

$(15.20 \times 36) + (15.20 \times 9 \times 1.5)$
\$752.40
B

13 What is the value of x (correct to one decimal place) in the triangle below?



Not to scale

(A) 4.2 cm
(B) 5.0 cm
(C) 5.4 cm
(D) 12.8 cm

$\tan 32 = \frac{x}{8}$
$x = 8 \tan 32$
$x = 5.0$
B

14 $(2x^3)^4$ is equal to:

(A) $8x^{12}$
(B) $2x^{12}$
(C) $16x^{12}$
(D) $212x^{12}$

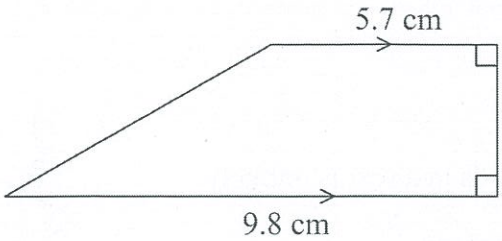
$16x^{12}$
C

15 The line $y = -x+1$ passes through which point?

(A) (0, 0)
(B) (0, –1)
(C) (0, 1)
(D) (0, 2)

$0 = -0+1$ ×
$-1 = -0+1$ ×
$1 = -0+1$ ✓
$2 = -0+1$ ×
C

16 What is the area (correct to the nearest square metre) of this shape?



Not to scale

(A) 24 cm^2
(B) 32 cm^2
(C) 38 cm^2
(D) 40 cm^2

$A = \frac{1}{2}(4.1)(5.7+9.8)$
$= 32\text{cm}^2$
B

17 When factorising a quadratic trinomial of the form x^2+bx+c we need to find 2 numbers which

(A) multiply to give b and add to give a
(B) multiply to give b and add to give c
(C) multiply to give c and add to give b
(D) multiply to give c and add to give a

C

18 A rectangular prism is 10 cm long, 8 cm wide and 4 cm high.
What is the surface area of the rectangular prism?

(A) 152 cm^2
(B) 304 cm^2
(C) 320 cm^2
(D) 640 cm^2

$SA = 2(10\times8 + 8\times4 + 4\times10)$
$= 304\text{cm}^2$
B

19 Which of the following is the correct factorisation of $3ab-a$?

(A) $a(3b-1)$
(B) $a(3b-a)$
(C) $3a(b-1)$
(D) $3a(b-a)$

$a(3b-1)$
A

20 A printer is marked at \$130 after being reduced by 30% in a one-day sale.
What was the original price of the printer?

(A) \$39.00
(B) \$91.00
(C) \$169.00
(D) \$185.71

$70\% = 130$
$1\% = \frac{130}{70}$
$100\% = \frac{130}{70}\times100$
$= \$185.71$
D

21 Ryan and Ava have three daughters. Ava would like to have a son. If they have another baby, how likely is it to be a boy?

(A) Unlikely, about 1 in 4.

(B) Quite likely, because four girls in a row is unlikely.

(C) Very likely, a probability of about $\frac{3}{4}$

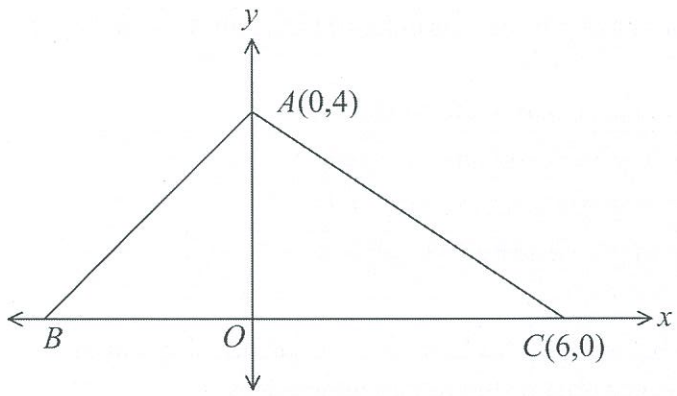
(D) Close to 50/50, a probability of about $\frac{1}{2}$

$\frac{1}{2}$ G

$\frac{1}{2}$ B

D

22 In the diagram below the area of ΔABC is 20 square units.



What are the coordinates of B?

(A) $(-5,0)$

(B) $(-4,0)$

(C) $(-2,0)$

(D) $(-1,0)$

$20 = \frac{1}{2} b \times 4$

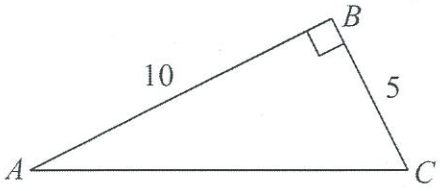
$20 = 2b$

$b = 10$

$\therefore B(-4,0)$

B

23 What is the length of the hypotenuse?



Not to scale

(A) 13 units

(B) 15 units

(C) $\sqrt{75}$ units

(D) $\sqrt{125}$ units

$(AC)^2 = \sqrt{5^2 + 10^2}$

$= \sqrt{125}$

D

24 A sum of \$8500 amounted to \$8925 after being invested for 6 months at simple interest. What was the interest rate earned?

(A) 8% p.a.
(B) 9% p.a.
(C) 10% p.a.
(D) 11% p.a.

$8925 - 8500 = 425$

$425 = 8500 \times r \times \frac{6}{12}$

$r = 0.1$

$\therefore 10\%$.

C

25 Solve $\frac{2}{2x-1} = \frac{-1}{x-2}$

(A) $x = 2$
(B) $x = \frac{1}{2}$
(C) $x = \frac{5}{4}$
(D) $x = \frac{4}{5}$

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

$2x - 4 = -2x + 1$

$4x = 5$

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

C

End of Section I

NAME: .....

TEACHER: **IMO** **GON** **MCR** **PLU**

Section II

25 Marks

Answer the questions in the spaces provided.
All necessary working should be shown in every question.

Question 1 (5 marks)

(a) Harry bought a pair of socks for \$6.00. The next day the price had risen to \$9.00. Find the percentage increase on the original price. **1**

$\frac{3}{6} \times 100 = 50\%$.

(b) Factorise fully $9x - 3x^2$ **1**

$3x(3-x)$

(c) Decrease 120 kg by 7.5% **1**

$92.5\% \times 120 = 111\text{ kg}$

(d) Simplify $\sqrt{120}$ **1**

$\sqrt{4} \times \sqrt{30} = 2\sqrt{30}$

(e) Simplify $(2x-1)(2x+1)$ **1**

$4x^2 - 1$

Question 3 (5 marks)

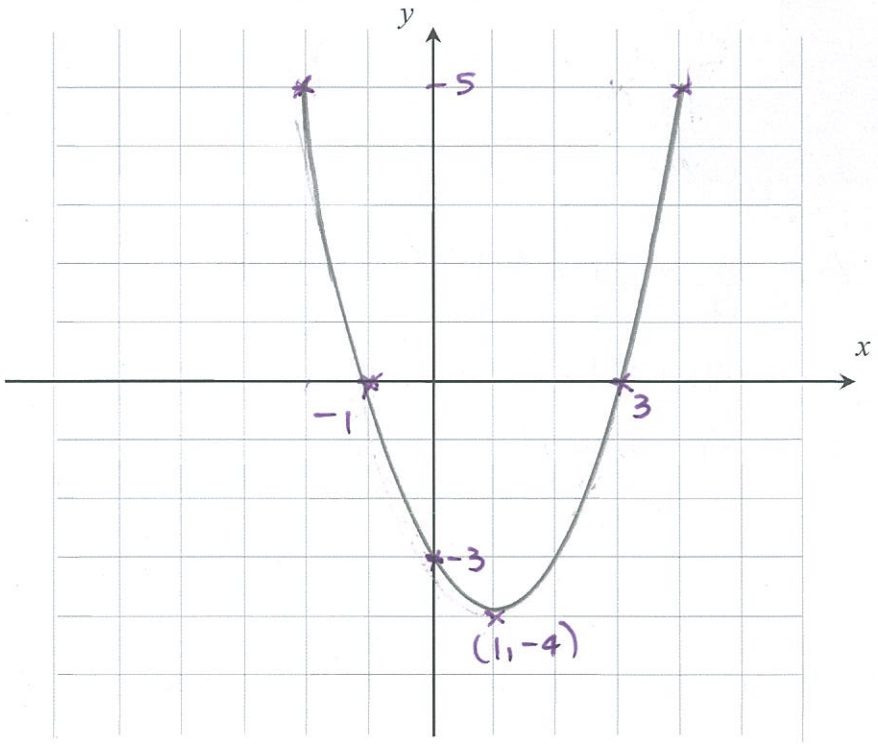
(a) Express $(3t)^{-2}$ with a positive index. **1**

$\frac{1}{(3t)^2} = \frac{1}{9t^2}$

(b) Write $a^{\frac{3}{2}}$ without indices. **1**

$a\sqrt{a}$

(c) Plot the graph of $y = x^2 - 2x - 3$ for $-2 \leq x \leq 4$ showing all key features. **3**



Let $y=0$ $\quad 0 = x^2 - 2x - 3$

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

$\therefore x = -1 \quad x = 3$

When $x = 1$ $\quad y = (1)^2 - 2(1) - 3$

$y = -4 \quad \therefore V(1,-4)$

Question 2 (5 marks)

(a) Simplify $\dfrac{3y^2 \times 6y^4}{9y^3}$. **1**

$\dfrac{18y^6}{9y^3} = 2y^3$

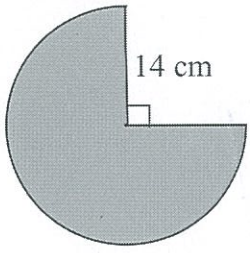
(b) Max is a cyclist who can ride one lap of the oval in 45 seconds. How many laps will Max have completed after riding for 6 minutes at the same speed? **1**

1 lap = 45 secs 6mins = 360secs

$\frac{1}{45}$ = 1 sec

$\therefore \frac{1}{45} \times 360 = 8$ laps

(c) Find the area of the following shape. Answer to the nearest whole number. **2**



$A = \frac{3}{4} \times \pi \times 14^2$

$= 461.814...$

$= 462 cm^2$

(d) Find Jordan's net pay for the week if he earns \$2060 but pays 35% of this in tax, pays 5% super, and his other deductions are \$230.50 per week. **1**

$2060 - (0.35 \times 2060) - (0.05 \times 2060) - 230.50$

$2060 - 721 - 103 - 230.50$

$= \$1005.50$

Question 4 (5 marks)

(a) A bag contains 7 blue cards, 2 yellow cards and 1 white card. One card is selected at random. What is the probability of NOT selecting a blue card? **1**

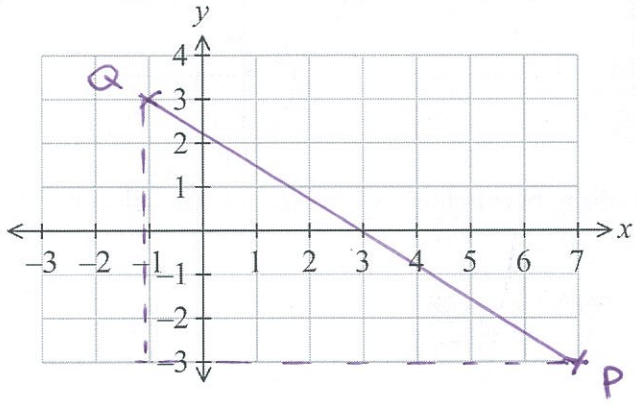
$7+2+1=10$ non blue $=3$

$\frac{3}{10}$

(b) Factorise $x^2+5x-24$. **1**

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

(c) P is the point (7, –3) and Q is the point (–1, 3). By plotting P and Q, or otherwise,



(i) Find the distance from P to Q. **1**

$d_{PQ} = \sqrt{6^2+8^2}$

$= 10$

(ii) Find the coordinates of the midpoint of PQ. **1**

Mdpt $\left(\frac{7-1}{2}, \frac{-3+3}{2}\right)$

$(3, 0)$

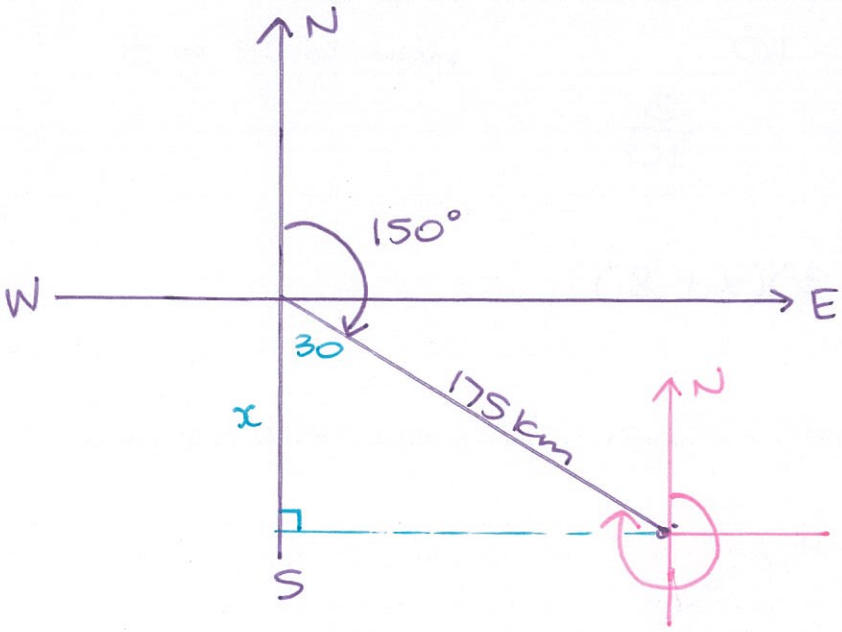
(iii) Find the gradient of PQ. **1**

$m_{PQ} = -\frac{6}{8} = -\frac{3}{4}$

Question 5 (5 marks)

A boat leaves port and travels 175 km on a bearing of 150°.

(a) Draw a diagram showing all key information **1**



(b) How far south of the port is the boat, to the nearest kilometre? **2**

$\cos 30 = \frac{x}{175}$

$x = 175 \cos 30$ $\quad x = 152 \text{ km}$

(c) What is the bearing of the port from the boat? **2**

$90 + 90 + 90 + 60 = 330°T$

End of Section II

NAME: .....

TEACHER: **IMO** **GON** **MCR** **PLU**

Section III: Working required — 30 marks

Answer the questions in the spaces provided.
All necessary working should be shown in every question.

(a) After 7 tests Emily has a mean of 78%. What score would Emily need in the next test to increase the mean to 80%? **2**

$7 \times 78 = \frac{546 + x}{8} = 80$

$546 + x = 640$

$x = 640 - 546$

$x = 94\%$

(b) Calculate the amount of compound ***interest*** earned if \$12,000 is invested for 6 years at 8 % p.a., compounded quarterly. (Answer to the nearest dollar) **2**

$A = 12000\left(1 + \frac{8\%}{4}\right)^{24}$

$A = \$19301.25$

$\therefore 19301.25 - 12000 = \$7301$

(c) Zoe has a box containing one blue marble and two red marbles. She selects two marbles at random. Find the probability of her selecting:

(i) two red marbles if she replaces the first marble before she selects the second marble. **1**

$\frac{2}{3} \times \frac{2}{3} = \frac{4}{9}$

(ii) one blue marble if she does not replace the first marble. **1**

$P(BR)$ or $P(RB)$

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

(d) A cylinder of height 18.5 cm has a volume of 1500 cm^3. What is the length of the radius of the cylinder? Answer to the nearest centimetre. **2**

$1500 = \pi \times r^2 \times 18.5$

$\frac{1500}{\pi \times 18.5} = r^2$

$r^2 = 25.8$

$r = 5\ cm$

(e) Simplify $\frac{m^2-m-6}{m^2-9} \times \frac{m^2}{m^2+2m}$. **3**

$\frac{(m-3)(m+2)}{(m-3)(m+3)} \times \frac{m^2}{m(m+2)}$

$\frac{m}{m+3}$

(f) Expand and simplify $(x+3)-(x-3)^2$ **2**

$x+3-(x^2-6x+9)$

$x+3-x^2+6x-9$

$7x-6-x^2$

(g) Expand and simplify $(x-x^{-1})^2$ **2**

$x^2-2\left(x.\frac{1}{x}\right)+(x^{-1})^2$

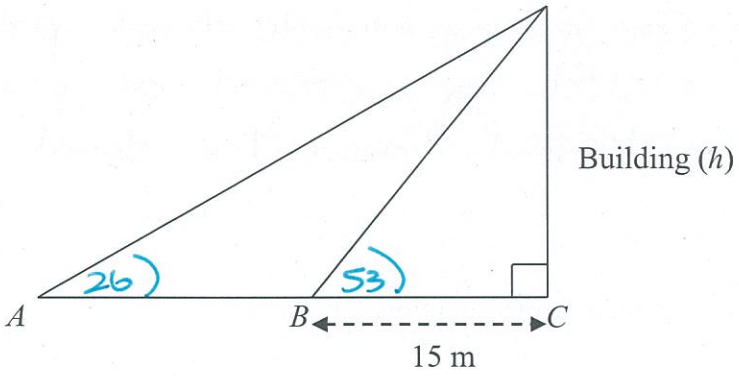
$x^2-2+\frac{1}{x^2}$

(h) Describe the transformations that needs to be made to the graph of $y = x^2$ to obtain the graph of: **3**

$$y = 2(x-5)^2 + 1$$

- Translated 5 units to right } V(5, 1)
- Translated 1 unit up
- Narrower than $y = x^2$

(i) Emma is standing looking up at the top of a building such that the angle of elevation is 26°. She then walks towards the building until the angle of elevation is 53°. She is now 15 m away from the base of the building.



α) Show that the height (h) of the building is 19·9 m. **2**

$$\tan 53 = \frac{h}{15}$$

$$h = 15 \tan 53$$

$$h = 19.9 \text{ m}$$

β) Find the distance that Emma walked from the first point (A) to the second point (B). Give your answer to the nearest metre. **3**

$$\tan 26 = \frac{19.9}{AC}$$

$$AC = \frac{19.9}{\tan 26}$$

$$AC = 40.8$$

$$\therefore AC - BC = AB$$

$$40.8 - 15 = 25.8 \quad = 26\text{m}$$

(j) A water tank is emptying according to the equation $A = 50 - 0.25t$ where A is the amount of water in the tank, in litres, and t is the time, in minutes.

(i) How much water is initially in the tank? **1**

When $t = 0$ $\quad A = 50 - 0.25(0)$

$A = 50$ litres

(ii) At what time is the tank half full? **2**

Half full when $A = 25$

$25 = 50 - 0.25t$

$0.25t = 25$

$t = 100$ mins

(iii) What does the gradient of this equation represent? **1**

For every minute that passes 0.25L or 250ml of water is released from the tank.

(k) Solve the simultaneous equations for x and y. **3**

$$3x + 2y = x - 3y$$
$$4x + 6y = 3x - 7$$

$2x + 5y = 0$ ... ①

$x + 6y = -7$ ... ② $\quad \times 2$

$2x + 12y = -14$ ... ③

③ − ①

$7y = -14$

$y = -2$

Sub $y = -2$ into ① to get;

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

$2x = 10$

$x = 5$ $\quad \therefore x = 5, y = -2$

End of Examination