NORMANHURST BOYS' HIGH SCHOOL
NEW SOUTH WALES

Full Name: _____

Teacher: **Lam Ridley Sekaran Tan** **(Please circle)**

2015
TERM 4 EXAMINATION
YEAR 9

MATHEMATICS

General Instructions

- Working time – 55 minutes
- Write using black or blue pen
  Black pen is preferred
- Board-approved calculators may be used
- In Section II, show relevant mathematical reasoning and/or calculations

Total marks – 58

Section I (15 marks)
- Mutiple-choice questions
- Allow about 18 minutes for this section

Section II (53 marks)
- Free-response questions
- Allow about 37 minutes for this section

OUTCOMES ASSESSED: A student

O1a Understands concepts in Financial mathematics and applies appropriate skills when solving problems
O1c Understands concepts in Algebraic Techniques and applies appropriate skills when solving problems
O1d Understands concepts in Indices and applies appropriate skills when solving problems
O1e Understands concepts in Equations and applies appropriate skills when solving problems
O1f Understands concepts in Linear relationships and applies appropriate skills when solving problems

Section	Outcomes					Total
	O1a	O1c	O1d	O1e	O1f	
I	1-8 /8				9-15 /7	/15
II	1 /8	4-5 /12	6-9 /12	10-12 /9	2-3 /12	/53
Total	/16	/12	/12	/9	/19	/68
						%

Section I – Multiple-choice (15 marks)

Use the multiple-choice answer sheet for Questions 1-15

1 During a sale in a music store all DVD's are reduced from $40 by 20%. What percentage increase is required to take the price back to $40?

(A) 20% (B) 25% (C) 80% (D) 120%

2 Shade cloth is sold in rolls of different widths. Which is the cheapest per square metre?

(A) *80* cm wide roll at $*7·20* per metre.

(B) *120* cm wide roll at $*9·60* per metre.

(C) *180* cm wide roll at $*13·00* per metre.

(D) *240* cm wide roll at $*18·00* per metre.

3

20% OFF TODAY ONLY SAVE $*15* ON TROUSERS

What is the cost of trousers today?

(A) $*12* (B) $*60* (C) $*75* (D) $*90*

4 A plumber buys goods to the value of $*4600* and then receives a *15*% trade discount. If the account is paid within *30* days, a *3*% reduction on the discounted price applies. The account was paid within *30* days. How much did the plumber pay?

(A) $*828* (B) $*3772* (C) $*3792·70* (D) $*4579·30*

5 A gas company's charges for a *3*-month period are:

First *750* units	*2·4192* cents per unit
Additional units over *750*	*1·244* cents per unit

The Martins used *2500* units of gas in this period. The total cost of this gas is

(A) $*21·77* (B) $*31·10* (C) $*39·91* (D) $*49·24*

6 A plumber buys goods to the value of $*4600* and then receives a *15*% trade discount. If the account is paid within *30* days, a *3*% reduction on the discounted price applies. The account was paid within *30* days. How much did the plumber pay?

(A) $*828* (B) $*3772* (C) $*3792·70* (D) $*4579·30*

7 Which of the following people receives the greatest salary?

(A) Barbara who receives $485 per week

(B) Margaret who receives $1010 per fortnight

(C) Anita who receives $2130 per month

(D) Helen who receives $26 200 per annum

8 Gavin works a 38-hour week and is paid \$15.30 per hour. When he takes his 4 weeks annual leave, he is paid a loading of $17\frac{1}{2}\%$. Gavin's weekly wage when he takes his leave is:

(A) \$*406.98* (B) \$*581.40* (C) \$683.15 (D) \$*2732.58*

9 The point (*a, 2*) lies on the line whose equation is $2x + y + 4 = 0$. The value of a is

(A) -8 (B) -3 (C) 3 (D) 8

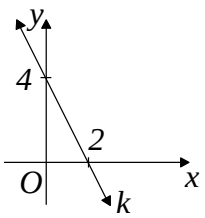
10 The gradient of the line $2x - 3y + 7 = 0$ is

(A) $-\frac{3}{2}$ (B) $-\frac{2}{3}$ (C) $\frac{2}{3}$ (D) $\frac{3}{2}$

11 The equation of the line through $(-3, 4)$ parallel to the y axis is

(A) $x = -3$ (B) $y = -3$ (C) $x = 4$ (D) $y = 4$

12



The equation of line k is

(A) $y = -2x + 2$ (B) $y = -2x + 4$

(C) $y = 2x + 2$ (D) $y = 2x + 4$

13 Which of these is the equation of a line parallel to $3x + 2y = 7$?

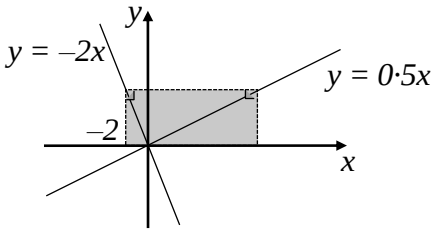
(A) $4x - 6y = 7$ (B) $4x + 6y = 7$

(C) $6x - 4y = 7$ (D) $6x + 4y = 7$

14 What is the y intercept of the line $5x - 2y - 10 = 0$?

(A) -10 (B) -5 (C) 5 (D) 10

15



Calculate the shaded area (in square units).

(A) *16* (B) *24* (C) *32* (D) *40*

End of Section I

Section II – Free-response (53 marks)

Show all necessary working and write your answers in the space provided

1 (a) Andy, Bianca, Candy and David invested money in the ratio 3 : 1 : 4 : 2 in a café. If the profit was shared according to their investment, and Andy's profit was $1800, find the profits of Bianca and Candy combined. [2 marks]

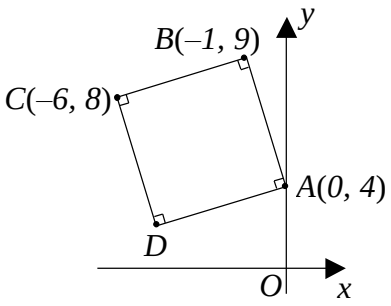
(b) Emma bought a car for $45000. The value of the car depreciates at 15% per year. Find the value of her car, to the nearest cent, after 3 years. [2 marks]

(c) When a crate of 24 bottles of 450 mL apple juice is purchased, the cost works out to be $2.80 per litre. A crate of 36 bottles of the same juice is advertised as being a saving of 10 cents per bottle compared with the 24 bottle crate. Calculate how much the 36-bottle crate costs. [2 marks]

(d) In one particular week, Grace works for 25 hours at normal time, 11 hours at time-and-a-half and 8 hours double time. If her wage for that week is $2225.25, what is her normal hourly rate of pay? [2 marks]

Outcome 1a
Total (Q1) _____ /8

2



ABCD is a square.

a. Find the gradient of *AB*. [2 marks]

b. Find the equation of the line *AB*. [1 mark]

c. Use your answer in (a) to find the gradient of *AD*, giving reason. [2 marks]

d. Find the coordinates of the centre of the circle that passes through *A*, *B*, *C*, and *D*. [2 marks]

3 A sales representative earns \$300 a week plus \$25 for each sale he makes.

a Write a rule for the total weekly wage, \$*W*, if the sales representative makes *n* sales. [1 mark]

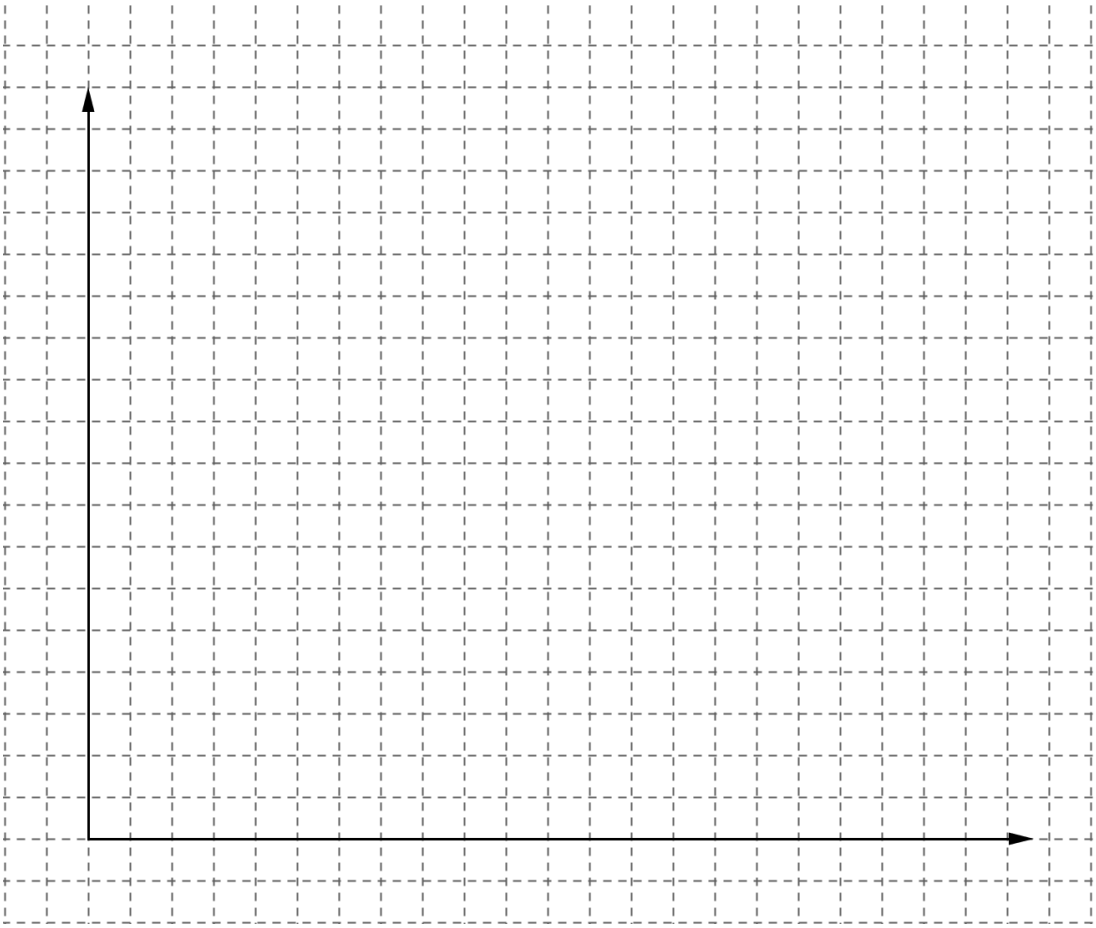
b How much does the sales representative earn if, in a particular week, he makes 12 sales? [1 mark]

c If, in a particular week, the sales representative earns \$675, how many sales did he make? [1 mark]

_____

_____

d Use the axes provided to draw the graph of W versus n using $0 \le n \le 20$. [2 marks]



Outcome 1f

Total (Q2-3) _____ /12

4 Factorise fully the following: [8 marks]

(a) $(x-3)^2-16$

(b) $x^2-4x-3xy+12y$

(c) $5x^2+6x-8$

(d) $x(x-5)-2(5-x)$

5 Simplify the following: [4 marks]

(a) $\frac{x^2+2x+1}{x^2-9} \div \frac{x+1}{(x-3)^2}$

(b) $\frac{2x+3}{6} - \frac{3x-2}{3}$

Outcome 1c
Total (Q4-5) _____ /12

6 Simplify, giving your answers in the simplest index form: [3 marks]

(a) $\frac{(3xy^2)^3 \times 9x^2}{27x^4y^5}$

(b) $(125x^6y^3)^{\frac{1}{3}}$

_____ _____

_____ _____

_____ _____

7 Express the following as a fraction in the simplest form without negative indices: [4 marks]

(a) $\frac{a^2+b^2}{a^{-1}+b^{-1}}$

(b) $\frac{5a^{-1}b^{-2}}{3^{-2}c^4d^{-2}}$

_____ _____

_____ _____

_____ _____

8 Find the value of x in the equation $3(2^{2x}) = 0.75$ [2 marks]

_____

_____

9 (a) Show that $2^{n+2} = 4 \times 2^n$. [3 marks]

(b) Use the result in (a) to simplify $\frac{2^{n+2}+2^n}{2^n}$.

_____ _____

_____ _____

_____ _____

Outcome 1d

Total (Q6-9) _____ /12

10 Solve the following equations: [4 marks]

(a) $\frac{2x+5}{4} = \frac{x-1}{3}$

(b) $1 - 2(2 - x) = 5(x - 3)$

11 Solve the inequality $-4x + 3 \leq 5x - 15$ [2 marks]

12 A multiple-choice test contains *30* questions. Each correct answer is given *5* marks. Each incorrect answer loses *2* marks. Each question not attempted loses *2* marks.
A student scored *101* marks on the test. The student answered *x* questions correctly.

(a) Write an equation representing the given problem [1 mark]

(b) Solve the equation for *x*. [2 marks]

Outcome 1e
Total (Q10-12) _____ /9

End of Paper

NORMANHURST BOYS' HIGH SCHOOL
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Full Name: Marker

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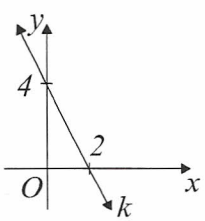
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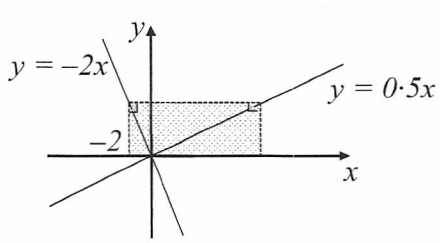
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(A) -10 (B) -5 (C) 5 (D) 10

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Calculate the shaded area (in square units).

(A) 16 (B) 24 (C) 32 (D) 40

End of Section I

Section II – Free-response (53 marks)

Show all necessary working and write your answers in the space provided

1 (a) Andy, Bianca, Candy and David invested money in the ratio 3 : 1 : 4 : 2 in a café. If the profit was shared according to their investment, and Andy's profit was $1800, find the profits of Bianca and ~~David~~ Candy combined. [2 marks]

Andy : 3 parts = $1800

1 part = $600 ✓

Bianca & Candy : 5 parts = 5 × $600 = $30 000 ✓

(b) Emma bought a car for $45000. The value of the car depreciates at 15% per year. Find the value of her car, to the nearest cent, after 3 years. [2 marks]

After 1 year, value = $45000 × 0.85 ✓

After 3 years, value = 45000×0.85^3

= $27635.63 ✓

(c) When a crate of 24 bottles of 450 mL apple juice is purchased, the cost works out to be $2.80 per litre. A crate of 36 bottles of the same juice is advertised as being a saving of 10 cents per bottle compared with the 24 bottle crate. Calculate how much the 36-bottle crate costs. [2 marks]

24-bottle crate : cost per bottle = 0.45 × $2.80

= $1.26 ✓

36-bottle crate : cost per bottle = $1.16

Total cost = $1.16 × 36

= $41.76 ✓

(d) In one particular week, Grace works for 25 hours at normal time, 11 hours at time-and-a-half and 8 hours double time. If her wage for that week is $2225.25, what is her normal hourly rate of pay? [2 marks]

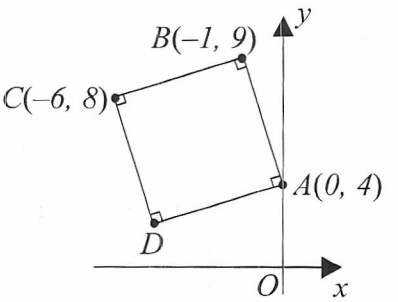
Let her normal hourly rate of pay = $x

$(25 + 11 \times 1.5 + 8 \times 2)x = 2225.25$ ✓

$x = \$38.70$ ✓

Outcome 1a
Total (Q1) _____ /8

2



ABCD is a square.

a. Find the gradient of *AB*. [2 marks]

$M_{AB} = \frac{9-4}{-1-0}$ ✓

$= -5$ ✓

b. Find the equation of the line *AB*. [1 mark]

$y = -5x + 4$ ✓

c. Use your answer in (a) to find the gradient of *AD*, giving reason. [2 marks]

$AB \perp AD \therefore M_{AD} = -\frac{1}{M_{AB}}$ ✓

$= \frac{1}{5}$ ✓

d. Find the coordinates of the centre of the circle that passes through *A*, *B*, *C*, and *D*. [2 marks]

centre $= \left(\frac{-6+0}{2}, \frac{8+4}{2}\right)$ ✓

$= (-3, 6)$ ✓

3 A sales representative earns \$300 a week plus \$25 for each sale he makes.

a Write a rule for the total weekly wage, \$*W*, if the sales representative makes *n* sales. [1 mark]

$W = 300 + 25n$ ✓

b How much does the sales representative earn if, in a particular week, he makes 12 sales? [1 mark]

$W = 300 + 25 \times 12$

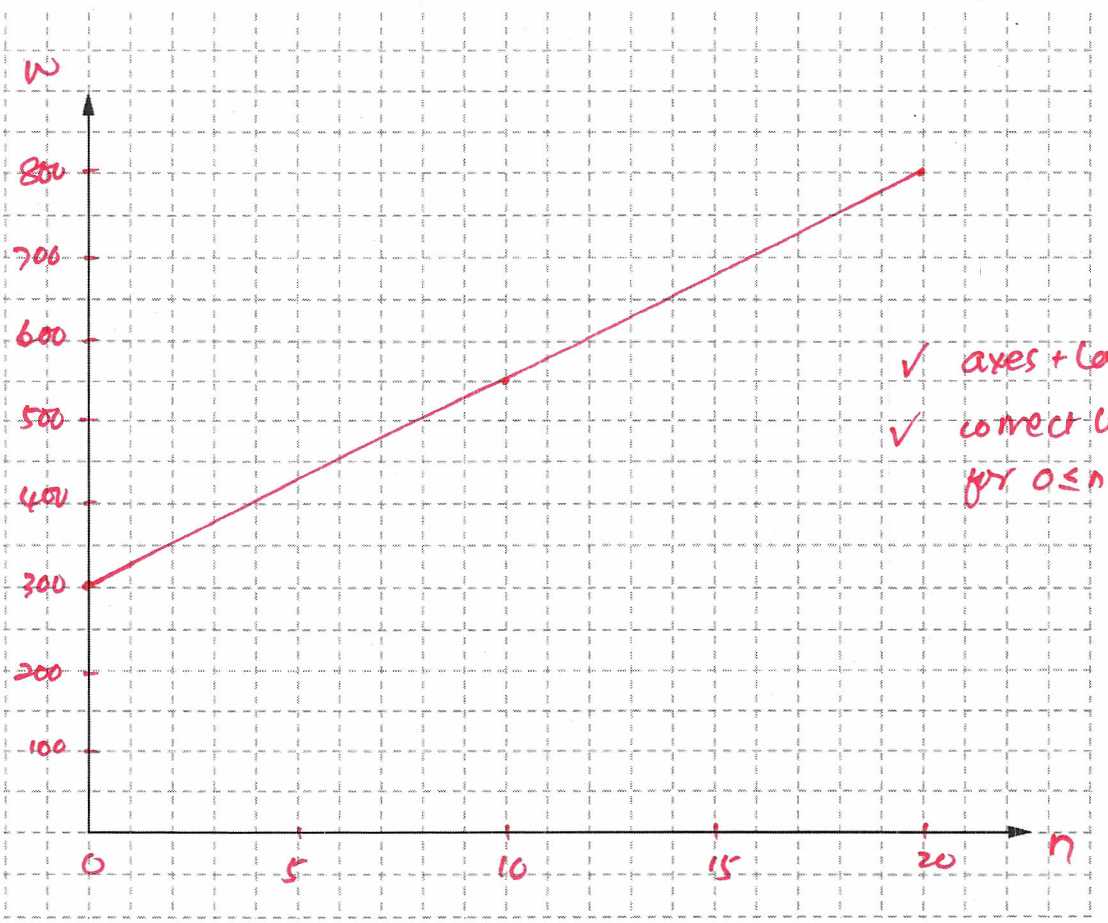
$= \$600$ ✓

c If, in a particular week, the sales representative earns \$675, how many sales did he make? [1 mark]

$675 = 300 + 25n$

$n = 15$ ✓

d Use the axes provided to draw the graph of W versus n using $0 \le n \le 20$. [2 marks]



✓ axes + labels
✓ correct line for $0 \le n \le 20$ only

Outcome 1f
Total (Q2-3) _____ /12

4 Factorise fully the following: [8 marks]

(a) $(x-3)^2 - 16$

$(x-3+4)(x-3-4)$ ✓

$= (x+1)(x-6)$ ✓

(b) $x^2 - 4x - 3xy + 12y$

$x(x-4) - 3y(x-4)$ ✓

$= (x-4)(x-3y)$ ✓

(c) $5x^2 + 6x - 8$

$(5x-4)(x+2)$

✓ ✓

(d) $x(x-5) - 2(5-x)$

$x(x-5) + 2(x-5)$ ✓

$= (x-5)(x+2)$ ✓

5 Simplify the following: [4 marks]

(a) $\frac{x^2+2x+1}{x^2-9} \div \frac{x+1}{(x-3)^2}$

$\frac{(x+1)^2}{(x+3)(x-3)} \times \frac{(x-3)^2}{x+1}$ ✓

$= \frac{(x+1)(x-3)}{x+3}$ ✓

(b) $\frac{2x+3}{6} - \frac{3x-2}{3}$

$\frac{2x+3-2(3x-2)}{6}$ ✓

$= \frac{7-4x}{6}$ ✓

Outcome 1c
Total (Q4-5) _____ **/12**

6 Simplify, giving your answers in the simplest index form: [3 marks]

(a) $\dfrac{(3xy^2)^3 \times 9x^2}{27x^4y^5}$

$\dfrac{27x^3y^6 \times 9x^2}{27x^4y^5}$ ✓

$= 9xy$ ✓

(b) $(125x^6y^3)^{\frac{1}{3}}$

$5x^2y$ ✓

7 Express the following as a fraction in the simplest form without negative indices: [4 marks]

(a) $\dfrac{a^2+b^2}{a^{-1}+b^{-1}}$

$\dfrac{a^2+b^2}{\frac{1}{a}+\frac{1}{b}}$ ✓

$= \dfrac{ab(a^2+b^2)}{a+b}$ ✓

(b) $\dfrac{5a^{-1}b^{-2}}{3^{-2}c^4d^{-2}}$

$\dfrac{5}{ab^2} \div \dfrac{c^4}{9d^2}$ ✓

$= \dfrac{45d^2}{ab^2c^4}$ ✓

8 Find the value of x in the equation $3(2^{2x}) = 0.75$ [2 marks]

$2^{2x} = 0.25$

$2^{2x} = 2^{-2}$ ✓

$2x = -2$

$x = -1$ ✓

9 (a) Show that $2^{n+2} = 4 \times 2^n$. ~~Hence~~ (b) use the result in (a) to simplify $\dfrac{2^{n+2}+2^n}{2^n}$. [3 marks]

$2^{n+2} = 2^2 \times 2^n$ ✓

$= 4 \times 2^n$

$\dfrac{4 \times 2^n + 2^n}{2^n} = \dfrac{5 \times 2^n}{2^n}$ ✓

$= 5$ ✓

Outcome 1d
Total (Q6-9) _____ **/12**

10 Solve the following equations: [4 marks]

(a) $\frac{2x+5}{4} = \frac{x-1}{3}$

$3(2x+5) = 4(x-1)$ ✓

$6x + 15 = 4x - 4$

$2x = -19$

$x = -\frac{19}{2}$ ✓

(b) $1 - 2(2 - x) = 5(x - 3)$

$1 - 4 + 2x = 5x - 15$ ✓

$-3x = -12$

$x = 4$ ✓

11 Solve the inequality $-4x + 3 \leq 5x - 15$ [2 marks]

$-9x \leq -18$ ✓

$x \geq 2$ ✓

12 A multiple-choice test contains *30* questions. Each correct answer is given *5* marks. Each incorrect answer loses *2* marks. Each question not attempted loses *2* marks.
A student scored *101* marks on the test. The student answered x questions correctly.

(a) Write an equation representing the given problem [1 mark]

$5x - 2(30 - x) = 101$

(b) Solve the equation for x. [2 marks]

$5x - 60 + 2x = 101$ ✓

$7x = 161$

$x = 23$ ✓

Outcome 1e
Total (Q10-12) _____ /9

End of Paper