Carlingford High School

Mathematics

Year 10 Term 3 Examination

5.3 Course

2020

Name: _____ Class: _____

Circle your teacher's name: Mrs Lobejko Mrs Lego Ms Tang Mr Wilson

Time allowed: 50 minutes

- Board approved calculators may be used.
- Show all necessary working.
- Marks may be deducted for careless or untidy work.
- Complete the examination in blue or black pen.

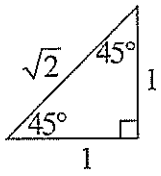
Coordinate Geometry	/15
Inequalities	/5
Trigonometry	/7
Probability	/13
TOTAL	/50

Trigonometric Functions

$$\sin A = \frac{\text{opp}}{\text{hyp}}, \quad \cos A = \frac{\text{adj}}{\text{hyp}}, \quad \tan A = \frac{\text{opp}}{\text{adj}}$$

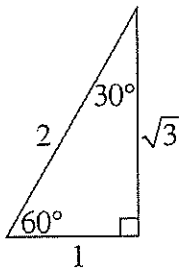
$$A = \frac{1}{2}ab\sin C$$

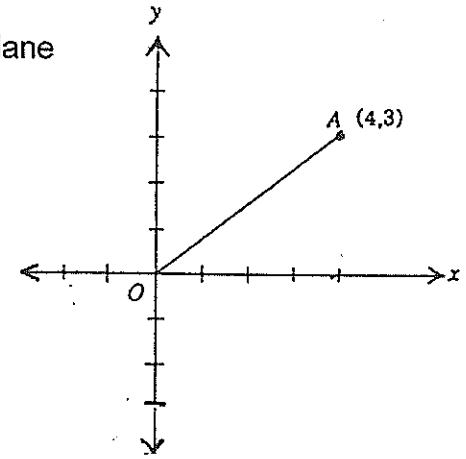
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$



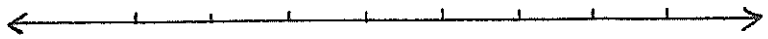
$$c^2 = a^2 + b^2 - 2ab\cos C$$

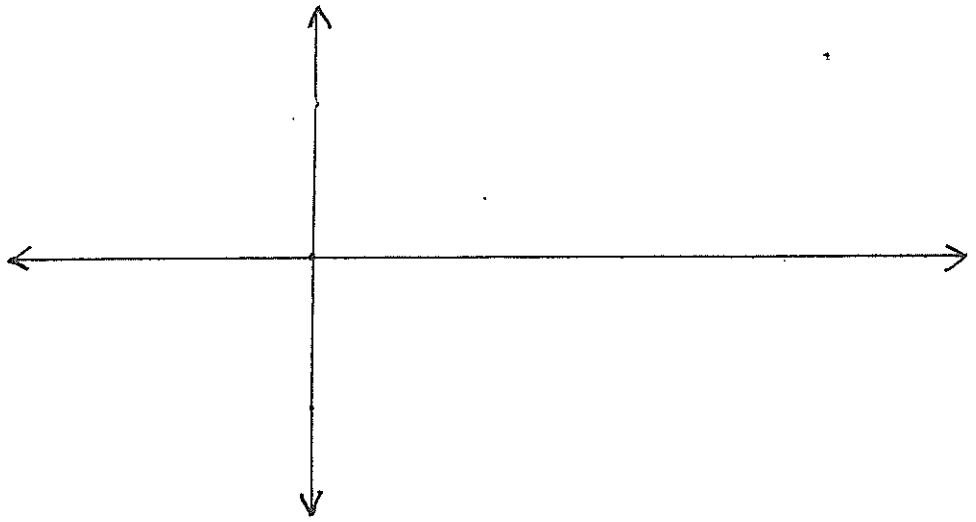
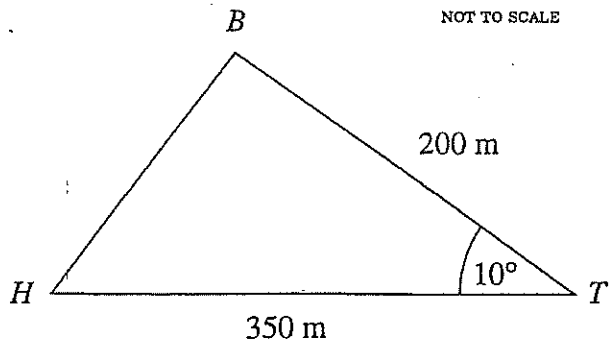
$$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$$

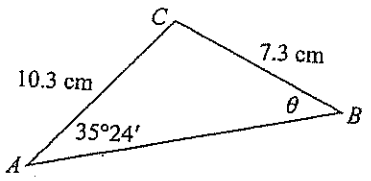
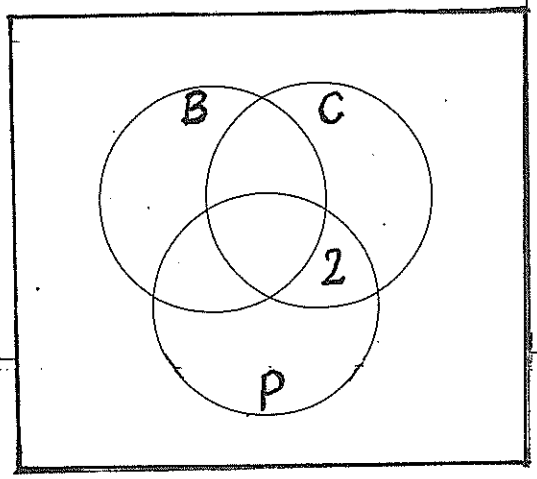


	COORDINATE GEOMETRY	15marks
1.	Find the gradient of line l if the line passes through the points $(-5, 1)$ and $(4, -17)$	1
2. (a)	Plot C (0, -3) and B (4, 0) on the number plane 	1
(b)	Show that the line BC has equation $3x - 4y - 12 = 0$	2
(c)	Prove that OABC is a parallelogram.	3

(d)	Find the area of the parallelogram.	1
(e)	Show that the diagonals bisect each other on the $x\ axis$.	3
3.	Show that the lines $y = 3x - 7$ and $6x + 3y - 1 = 0$ are perpendicular, parallel or neither.	2
4.	Find the equation of the line that is parallel to $y = x$ and passes through the point (4, 9).	2

	INEQUATIONS	5 marks
1.	Solve the following inequations and graph the solution to (a) on the number line	
(a)	$5 - 3x < 8$ 	3
(b)	$\frac{x}{3} + \frac{3x}{2} \geq -1$	2
	TRIGONOMETRY	17marks
1.	Solve the following equations considering $0° \leq \theta \leq 360°$	
(a)	$2cos\ \theta = \sqrt{3}$	2
(b)	$tan\ \theta = -0.48$ (answer to the nearest degree)	2

2. (a)	**Sketch** $y = sinx$ and $y = cosx$ from $0°$ *to* $180°$ on the number plane below. 	3
(b)	From your graph, approximate the y value of the intersection point of the two curves.	1
3. (a)	Calculate the length of BH to the nearest metre. 	2
(b)	Find the area of the triangle BHT (to1dp)	2

4.	Using the Sine Rule find the value of θ (in degrees and minutes) Diagram is not to scale.  	3
5.	Henry notes that the angle of elevation to the top of a building is 22°. He walks 120 $metres$ towards the building and the angle of elevation is now 28°. How tall is the building? (answer to nearest m)	3
	PROBABILITY	13marks
1.	150 students were asked what activity they do on the weekend. 30 **only** play Basketball, 18 play Piano, 85 play Chess. 3 students do all three activities, 25 play both basketball and chess, 7 play both basketball and piano. 22 students prefer not to be active. Complete the Venn Diagram to show this information.  	2

2.			2

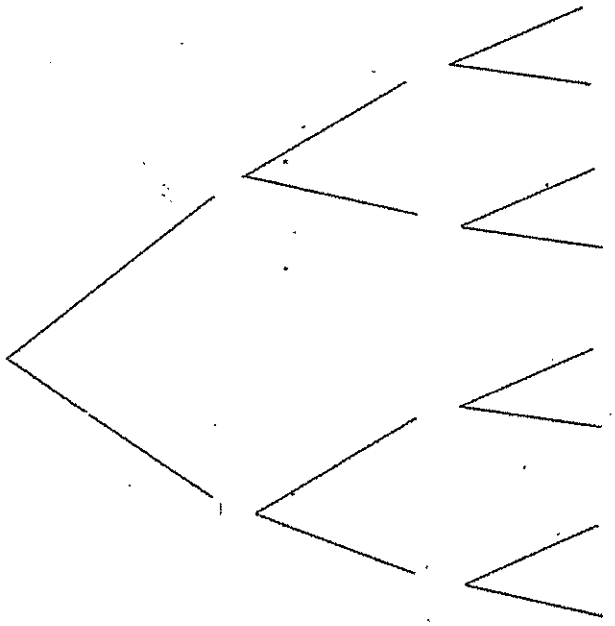
	Poor memory recall	Strong memory recall
Slept over 8 hours	23	85
Slept less than 6 hours	78	14

A group of students participated in research on the effect of sleep on memory recall the following day. Use the table above to answer the questions.

(a) What is the percentage probability of randomly selecting a person with strong memory recall who slept over 8 hours?

(b) What is the probability of choosing a person from those who slept less than 6 hours who has poor memory recall?

3. A box contains 8 red marbles and 11 green marbles. Three marbles are selected one at a time without replacement. Complete the probability tree. — 2

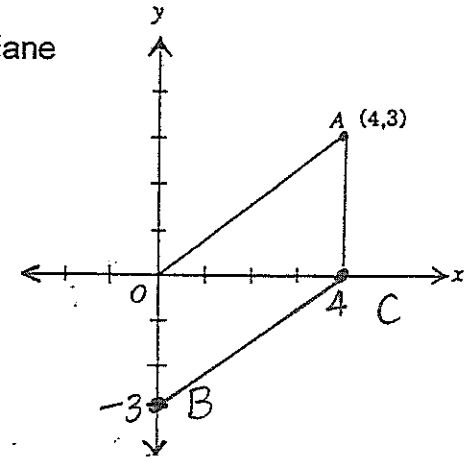


(a) What is the probability of choosing green, red, green in that order? — 1

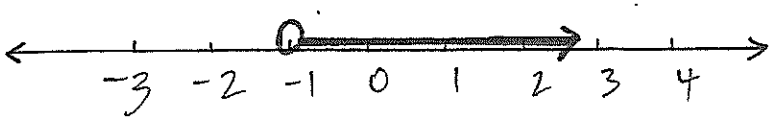
(b) What is the probability of choosing three marbles of the same colour? — 2

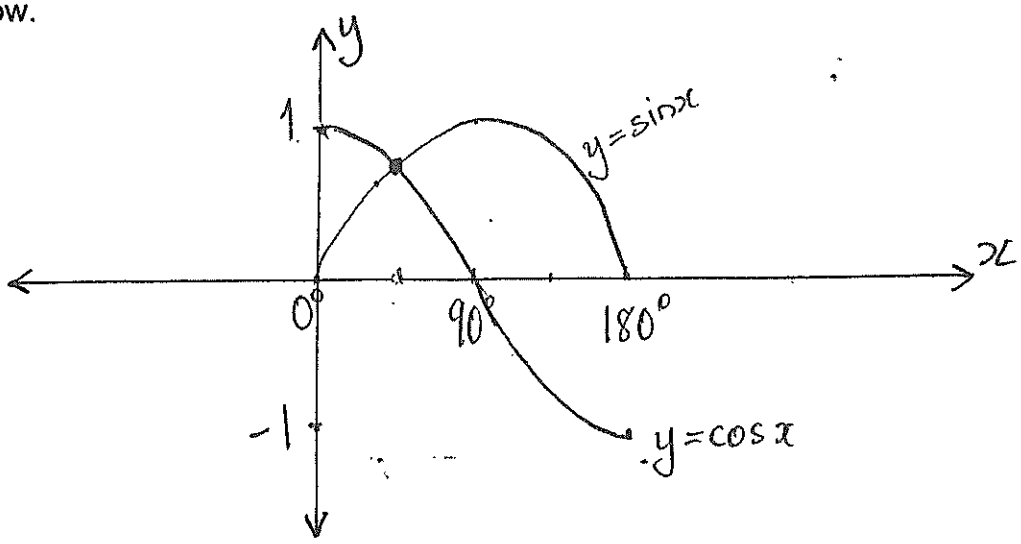
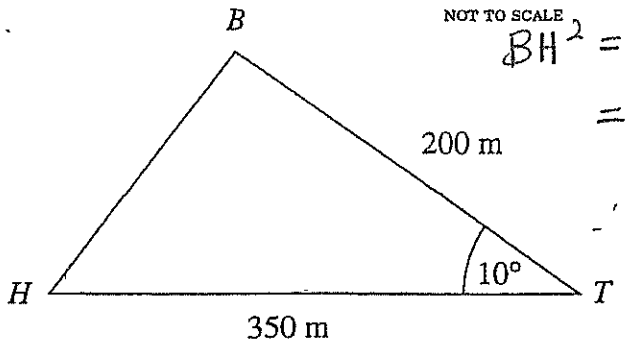
4.	Two dice are rolled and the product of the two numbers is calculated.	
(a)	Given that one of the numbers is a 5, what is the probability of getting a product that is odd?	1
(b)	If the first number is odd, find the probability of an even product.	1
5.	Students that study at least one of the languages, French and Japanese attend a meeting. Of the 28 students present, 18 study French and 22 study Japanese. What is the probability that two randomly selected students both study French only?	2

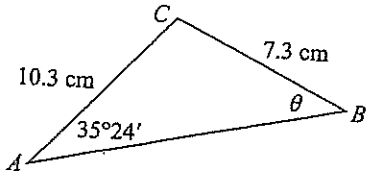
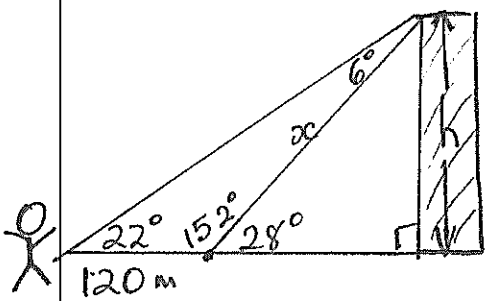
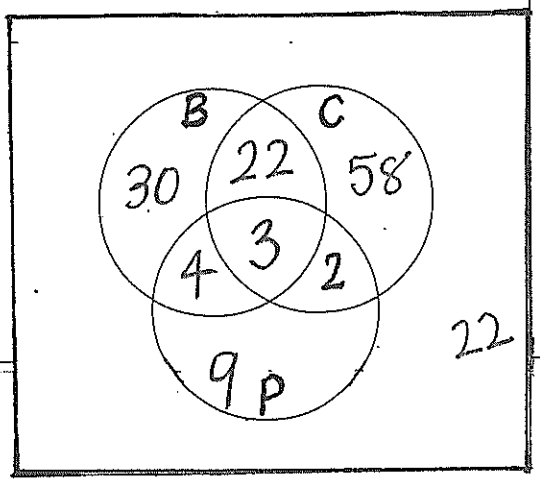
THE END

	COORDINATE GEOMETRY	15marks
1.	Find the gradient of line l if the line passes through the points $(-5, 1)$ and $(4, -17)$ $m = \frac{1-(-17)}{-5-4}$ $= \frac{18}{-9}$ $= -2$	1
2. (a)	Plot C (0, -3) and B (4, 0) on the number plane 	1
(b)	Show that the line BC has equation $3x - 4y - 12 = 0$ $m_{BC} = \frac{3}{4}$ y intercept $= -3$ $y = \frac{3}{4}x - 3$ $4y = 3x - 12$ $3x - 4y - 12 = 0$	2
(c)	Prove that OABC is a parallelogram. OB $\parallel$ AC OB & AC are vertical lines (equal gradient) $m_{OA} = \frac{3}{4}$ rise / run $\quad m_{BC} = \frac{3}{4}$ $m_{OA} = m_{BC} \quad \therefore$ OA $\parallel$ BC Since opposite sides are parallel, OABC is a parallelogram (Since both pairs of opposite sides are parallel) OR ~~Show~~ both pairs of opposite sides are equal in length	3

(d)	Find the area of the parallelogram. $A = 4 \times 3$ $= 12 \text{ units}^2$	1
(e)	Show that the diagonals bisect each other on the x *axis*. Show midpoints are equal and on the x-axis $\text{Midpoint}_{AB} = \left(\frac{4+0}{2}, \frac{3-3}{2}\right) = (2,0)$ $\text{Midpoint}_{AC} = \left(\frac{0+4}{2}, 0\right) = (2,0)$ Since they have the same midpoint and $(2,0)$ is on the x-axis the diagonals bisect each other on the x-axis.	3
3.	Show that the lines $y = 3x - 7$ and $6x + 3y - 1 = 0$ are perpendicular, parallel or neither. $m_1 = 3$ $3y = -6x + 1$ $y = -\frac{6}{3}x + \frac{1}{3}$ $\therefore m_2 = -2$ $m_1 \neq m_2$ $m_1 \times m_2 \neq -1$ $\therefore$ lines are neither parallel or perpendicular.	2
4.	Find the equation of the line that is parallel to $y = x$ and passes through the point (4, 9). $m = 1$ $y - y_1 = m(x - x_1)$ $y - 9 = 1(x - 4)$ $y = x + 5$	2

	INEQUATIONS	5 marks
1.	Solve the following inequations and graph the solution to (a) on the number line	
(a)	$5 - 3x < 8$ $-3x < 3$ $x > -1$  	3 2 marks for number line.
(b)	$\frac{x}{3} + \frac{3x}{2} \geq -1$ $\frac{2x + 9x}{6} \geq -1$ $11x \geq -6$ $x \geq \frac{-6}{11}$	2
	TRIGONOMETRY	17marks
1.	Solve the following equations considering $0° \leq \theta \leq 360°$	
(a)	$2\cos\theta = \sqrt{3}$ $\cos\theta = \frac{\sqrt{3}}{2}$ $\therefore \theta = 30°, (360° - 30°)$ $= 30°, 330°$ S | A ✓ T | C ✓	2
(b)	$\tan\theta = -0.48$ (answer to the nearest degree) $\theta = 26°$ acute $\theta = (180° - 26°), (360° - 26°)$ $= 154°, 334°$ ✓ S | A T | C ✓	2

2. (a)	**Sketch** $y = sinx$ and $y = cosx$ from $0°$ *to* $180°$ on the number plane below.  	3
(b)	From your graph, approximate the y value of the intersection point of the two curves. 0·7	1
3. (a)	Calculate the length of BH to the nearest metre.  $BH^2 = 200^2 + 350^2 - 2(200)(350)\cos 10°$ $= 24626.91458...$ $\therefore BH = 156.929...$ $= 157$ m	2
(b)	Find the area of the triangle BHT (to1dp) $A = \frac{1}{2}ab\sin C$ $= \frac{1}{2} \times 200 \times 350 \times \sin 10°$ $= 6077.686...$ $\doteq 6077.7\ m^2$	2

4.	Using the Sine Rule find the value of θ (in degrees and minutes) Diagram is not to scale.  $\frac{\sin\theta}{10.3} = \frac{\sin 35°34'}{7.3}$ $\sin\theta = \frac{\sin 35°34' \times 10.3}{7.3}$ $\therefore \theta = 54°49'$ OR $125°11'$ acute obtuse $125°11' + 35°24' < 180°$ $\therefore$ both angles are possible.	3
5.	Henry notes that the angle of elevation to the top of a building is 22°. He walks 120 *metres* towards the building and the angle of elevation is now 28°. How tall is the building? (answer to nearest m)  $\frac{x}{\sin 22°} = \frac{120}{\sin 6°}$ $x = \frac{120}{\sin 6°} \times \sin 22°$ $= 430.053..$ height: $\sin 28° = \frac{h}{430.05}$ $h = 430.05 \times \sin 28°$ $= 202$ m	3
	PROBABILITY	13marks
1.	150 students were asked what activity they do on the weekend. 30 **only** play Basketball, 18 play Piano, 85 play Chess. 3 students do all three activities, 25 play both basketball and chess, 7 play both basketball and piano. 22students prefer not to be active. ~~Complete the Venn Diagram~~ to show this information. 1 mark for 3 and 22 2 marks for all correct  	2

2. — 2

	Poor memory recall	Strong memory recall
Slept over 8 hours	23	85
Slept less than 6 hours	78	14

A group of students participated in research on the effect of sleep on memory recall the following day. Use the table above to answer the questions.

(a) What is the percentage probability of randomly selecting a person with strong memory recall who slept over 8 hours?

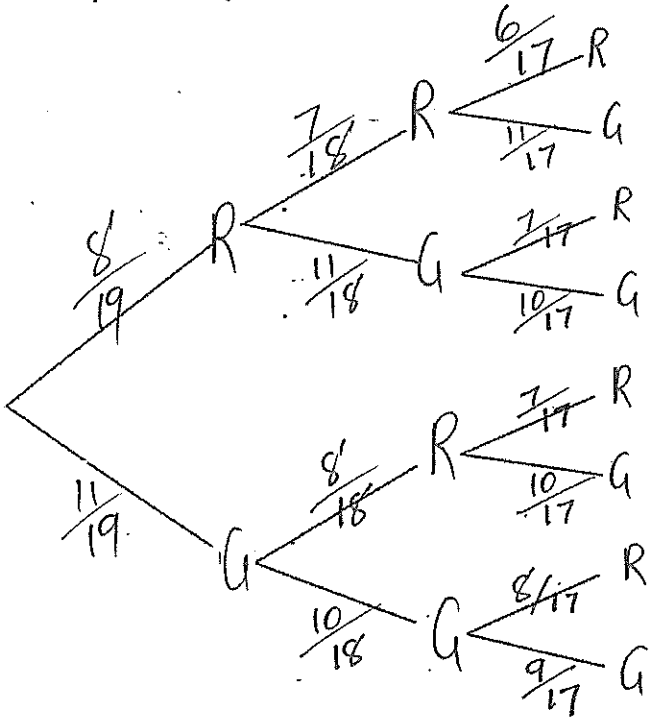
$\frac{85}{200} \times 100\% = 42.5\%$

(b) What is the probability of choosing a person from those who slept less than 6 hours who has poor memory recall?

$\frac{78}{92}$ OR $\frac{39}{46}$ OR 84.8%

3. — 2

A box contains 8 red marbles and 11 green marbles. Three marbles are selected one at a time without replacement.
Complete the probability tree.



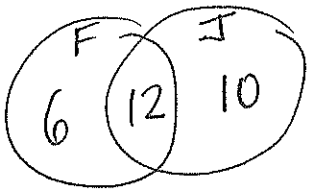
(a) What is the probability of choosing green, red, green in that order? — 1

$P(GRG) = \frac{11}{19} \times \frac{8}{18} \times \frac{10}{17}$ OR $\frac{440}{2907}$

(b) What is the probability of choosing three marbles of the same colour? — 2

$P(RRR) + P(GGG)$

$= \left(\frac{8}{19} \times \frac{7}{18} \times \frac{6}{17}\right) + \left(\frac{11}{19} \times \frac{10}{18} \times \frac{9}{17}\right) = \frac{13}{57}$

4.	Two dice are rolled and the product of the two numbers is calculated.	
(a)	Given that one of the numbers is a 5, what is the probability of getting a product that is odd? $5 \times 1 = 5$ $5 \times 2 = 10$ $5 \times 3 = 15$ $5 \times 4 = 20$ $5 \times 5 = 25$ $5 \times 6 = 30$ $\frac{3}{6} = \frac{1}{2}$	1
(b)	If the first number is odd, find the probability of an even product. $1 \times 1 = 1$ $1 \times 4 = 4$ $3 \times 2 = 6$ $3 \times 5 = 15$ $5 \times 3 = 15$ $5 \times 6 = 30$ $\frac{1}{2}$	1
5.	Students that study at least one of the languages, French and Japanese attend a meeting. Of the 28 students present, 18 study French and 22 study Japanese. What is the probability that two randomly selected students both study French only?  $P(FF) = \frac{6}{28} \times \frac{5}{27}$ $= \frac{30}{756}$	2

THE END