

St George Christian School

Year 10 FINAL EXAMINATION
Paper 2

Mathematics 10B

General Instructions

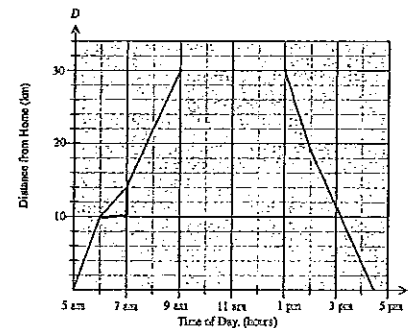
- Working time – 60 minutes
- Write using black or blue pen
- Board of Studies approved calculators are allowed
- No liquid paper allowed
- Attempt all questions
- All necessary working should be shown in every question

Rates and Proportions	/8
Bivariate Data	/7
Probability	/11
Trigonometry	/13
Properties of Geometrical Figures	/11
Total:	/50
	%

Rates and Proportion (8 marks)

Question 1

The distance time graph represents Emily's day out, riding her bicycle from her home on a farm into town and back home.



- a) How long did Emily remain in town?(1)

- b) What was the slowest speed at which Emily cycled?(2)

Question 2

The amount of fertiliser needed for a paddock (F kg) is directly proportional to the area of the paddock (A m²).

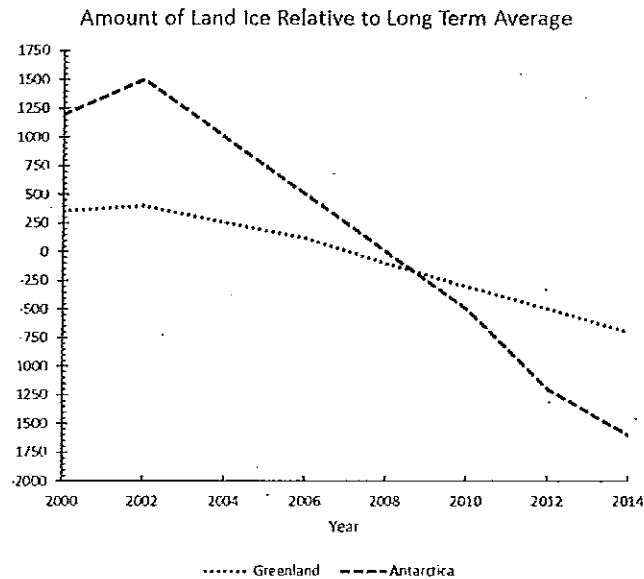
- a) Write a proportion equation, using the variable A and F and a constant k . (1)

- b) Given that a paddock with area 20 ha, requires 85 kg of fertiliser, find the value of the constant k . (1 ha = 10 000 m²)(2)

- c) Calculate the size of the paddock that could be fertilised with 595 kg of fertiliser. Give your answer in hectares. (2)

Bivariate Data (7 marks)

Question 3



For the following questions, refer to the line graph above.

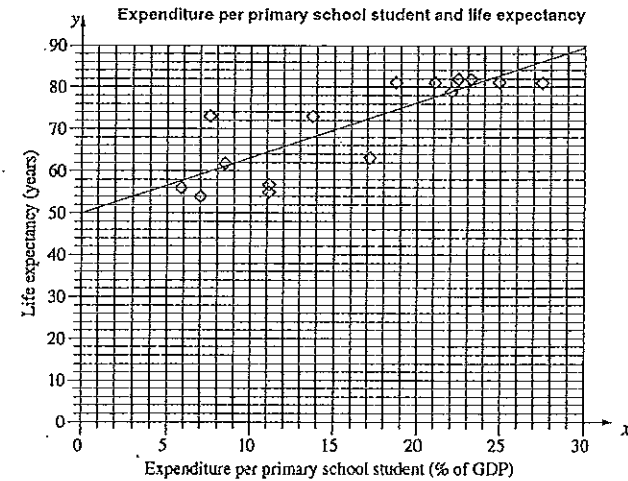
- a) Circle the correct statement. (1)
- A Antarctica reached the zero point about six months before Greenland.
 - B Antarctica reached the zero point about a year before Greenland.
 - C Greenland reached the zero point about six months before Antarctica.
 - D Greenland reached the zero point about a year before Antarctica.

- b) When was the greatest loss of mass in a two year period? Circle the correct answer. (1)

- A. In Antarctica between 2004 – 2006.
- B. In Greenland between 2004 – 2006.
- C. In Greenland between 2010 – 2012.
- D. In Antarctica between 2012 – 2014

Question 4

The scatterplot shows the relationship between expenditure per primary school student, as a percentage of a country's Gross Domestic Product (GDP), and the life expectancy in years for 15 countries.



- a) Describe the relationship between expenditure per primary school student and life expectancy. (1)

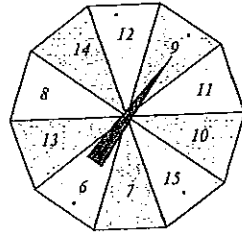
- b) Find the gradient of the line of best fit. (2)

- c) Find the equation of the line of best fit. (2)

Probability (11 marks)

Question 5

A spinner has ten equal sectors numbered 6 to 15 as shown.



a) What is the probability that it lands on a number greater than 6?(1)

b) What is the probability that it lands on a number that is a multiple of 3?(1)

Question 6

There are four cards marked with letters 0, 1, 2 and 3. They are put in a box. Two cards are selected at random, one after the other, to form a two-digit number.




a) Draw up a tree diagram to represent this multi-stage event.(2)

b) What is the probability that the number formed is less than 20.(1)

Question 7

John is buying a car. He has the choice of a sedan, a hatchback or a wagon and he likes four colours; aqua, burgundy, cyan, and emerald.

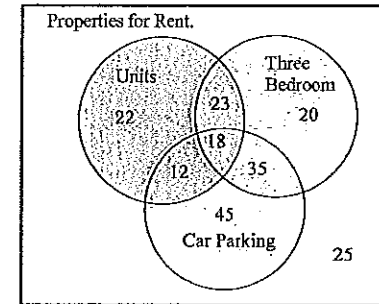
Complete the two-way table to show the possible combinations he can choose from. (1)

	Sedan 	Hatch 	Wagon 
Aqua			
Burgundy			
Cyan			
Emerald			

If he chose one combination at random, what is the probability it would be a sedan or would be burgundy, but not both?(1)

Question 8

The Venn Diagram summarises available rental properties in Hurstville.



a) Find the relative frequency of the properties that have car parking available.(2)

b) If one of the units was chosen at random, what is the probability that it has three bedrooms and car parking?(2)

Trigonometry (13 marks)

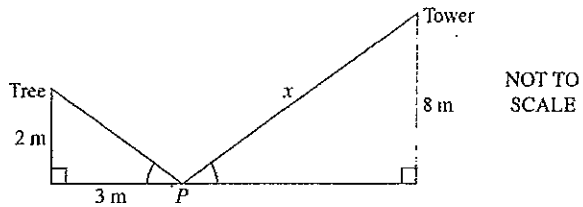
Question 9

For $\sin \theta = 0.1863$, find all possible values for θ where $0^\circ < \theta < 180^\circ$, correct to the nearest degree. (2)

Question 10

A point P lies between a tree, 2 metres high, and a tower, 8 metres high. P is 3 metres away from the base of the tree.

From P , the angles of elevation to the top of the tree and to the top of the tower are equal.



What is the distance, x , from P to the top of the tower?

(4)

Question 11

From a point, P , a ship (S) is sighted 12.4 km from P on a bearing of 137° . A point, Q , is due south of P and is a distance of 31.2 km from the ship.

a) Draw a diagram representing this information. (2)

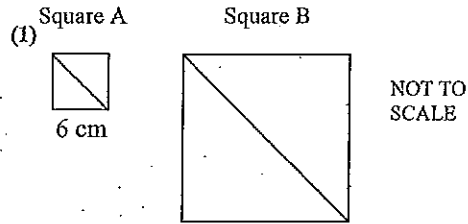
b) Calculate the bearing of the ship from Q , correct to the nearest degree. (5)

Properties of Geometrical Figures (11 marks)

Question 12

Square A is enlarged, with a scale factor of 3, to produce Square B.

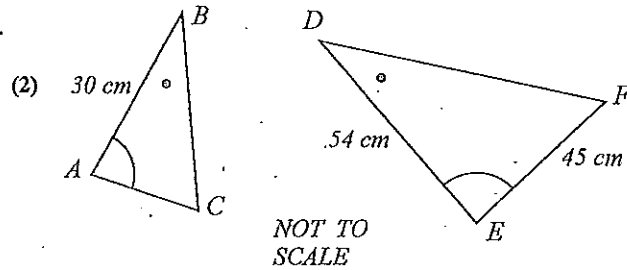
Find the side length of Square B.



Question 13

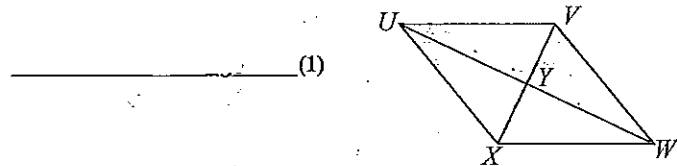
Given $\triangle ABC \parallel \triangle EDF$.

Find the length of AC.



Question 14

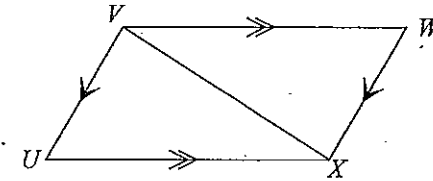
The diagonals of the rhombus $UVWX$ are drawn, intersecting at Y .
We can assume a rhombus to be a quadrilateral with all sides equal.
Assume no other properties of the rhombus.
Which of the congruence tests is sufficient to prove that $\triangle UVY \cong \triangle WYX$?



Question 15

Given that $VW \parallel UX$ and $VU \parallel WX$. Prove that $\triangle UVX \cong \triangle WXV$.

(4)



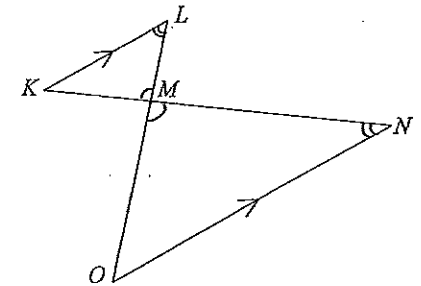
Question 16

For the diagram shown,

$KL \parallel ON$.

Prove that $\triangle MLK \parallel \triangle MON$.

(3)



⊙ END OF EXAMINATION ⊙

St George Christian School

Yr 10 FINAL. 10B.

[SAMPLE SOLUTIONS]

1. a) 4 hours: (9 am - 1 pm)

b) slowest speed = least steep point in graph. (1)

Slope between 6-7 am is least steep

Travelled 4 km, so slowest speed was 4 km/h.

2. F is proportional to area of paddock.

a) $A = kF$, meaning it is always a linear relationship

b) $20(10000) = k85$

$$\frac{200000}{85} = k.$$

$$k = 2353 \text{ (nearest integer)}$$

c) $A = 2353F$
 $= 2353(595)$
 $\approx 1400000 \text{ m}^2$
 $\approx 140 \text{ Ha.}$

Bivariate Data.

3 a) c (From graph)

b) A (2004-2006 Antarctica has the greatest slope). (2)

4. a) The Expenditure per primary school student (% of GDP) has an increasing relationship with life expectancy, that is, from the graph, Expenditure increases when Life Expectancy increases.

b). $\frac{(y_2 - y_1)}{(x_2 - x_1)}$ take (0, 50) and (30, 90) as reference points

$$\frac{90 - 50}{30 - 0} = m \rightarrow \frac{40}{30} = m = \frac{4}{3}.$$

c) take (0, 50) as reference point gradient formula

$$(y - 50) = m(x - 0)$$

$$y - 50 = \frac{4}{3}x$$

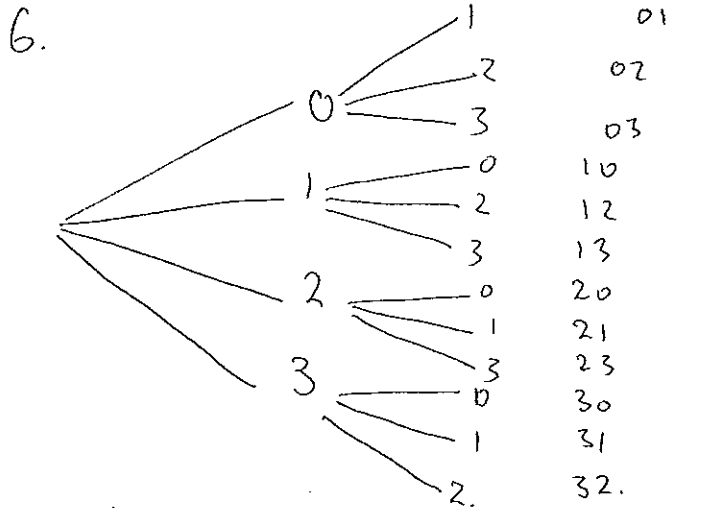
$$y = \frac{4}{3}x + 50$$

Probability.

5. Sample size = $\{6, 7, 8, 9, 10, 11, 12, 13, 14, 15\}$

a) $P(\text{number greater than 6}) = \frac{9}{10}$

b) $P(\text{number of multiple 3}) = \frac{4}{10} = \frac{2}{5}$



b) $P(N < 20) = \frac{6}{12} = \frac{1}{2}$

7

	SEDAN	HATCH	WAGON
Aqua	Aqua Sedan	Aqua Hatch	Aqua Wagon
Burgundy	Burgundy Sedan	Burgundy Hatch	Burgundy Wagon
Cyan	Cyan Sedan	Cyan Hatch	Cyan Wagon
Emerald	Emerald Sedan	Emerald Hatch	Emerald Wagon

a) $\frac{5}{12}$ Burgundy DR SEDAN EXCEPT BURGUNDY SEDAN.

8. Properties For Rent.

Total number of units = $22 + 23 + 18 + 12$ (1)

Total number of 3 bedroom units = $20 + 35$ (2)

Total number of car parking = 45 (3)

(1) + (2) + (3) = 175

places that have parking available

= $12 + 18 + 35 + 45 = 110$

a) Relative frequency = $\frac{110}{175} = \frac{22}{35}$

b) $\frac{18}{75} = \frac{6}{25}$

10. Let the angle of elevation be θ .

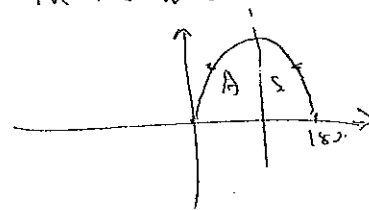
then $\frac{2}{3} = \tan \theta$

$\theta = \tan^{-1} \frac{2}{3}$
 $\approx 33.7^\circ$

$\frac{8}{x} = \sin \theta = \sin 33.7^\circ$

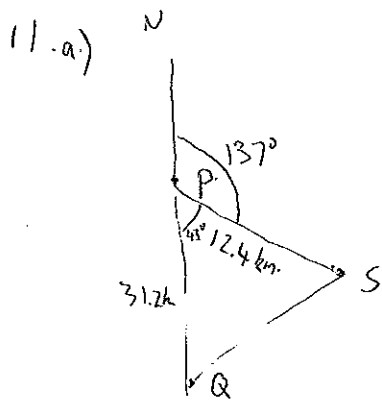
$x \approx 14.42 \text{ m.}$

Can also use similar triangles to find x .



$\theta = \sin^{-1}(0.1863)$

$\theta \approx 10.73^\circ$ AND 169.26°



(5)

b) We wish to find $\angle PQS$.

find SQ from cosine rule and then use sine rule to find $\angle PQS$.

$$SQ^2 = 12.4^2 + 31.2^2 - 2(12.4)(31.2)\cos 43^\circ$$

$$SQ \approx 23.7 \text{ km.}$$

$$\frac{23.7}{\sin 43^\circ} = \frac{12.4}{\sin x}$$

lets call $\angle PQS = 'x'$

$$\sin^{-1}\left(\frac{12.4 \sin 43^\circ}{23.7}\right) = x$$

$$x \approx 20.9^\circ$$

\therefore Bearing of the ship from Q
 $= 20.9^\circ$

12. \rightarrow Properties of geometrical figures.

$$\text{length}_B = 6 \times 3 = 18$$

ORIGINAL SIZE ENLARGEMENT FACTOR.

13. Because $\triangle ABC \sim \triangle EDF$

(6)

$$\frac{30}{54} = \frac{AC}{45}$$

$$AC = 25 \text{ cm.}$$

14. SSS Test

15. in $\triangle UWX$ and $\triangle VWX$.

$$\angle UXV = \angle XVW \text{ (alternate)}$$

$$\angle WXV = \angle XVU \text{ (alternate)}$$

XV is common in both triangles.

\therefore we can use AAS Test

$$\therefore \triangle UWX \cong \triangle VWX$$

\therefore Therefore $\angle UWX = \angle VWX$
 (Angle sum of triangle)

16. in $\triangle KLM$ and $\triangle NOM$.

$$\angle LKN = \angle KNO \text{ (Alternate)}$$

$$\angle KLM = \angle LON \text{ (Alternate)}$$

$$\angle KML = \angle OMN \text{ (vertically opposite)}$$

$$\therefore \triangle MLK \cong \triangle MON \text{ (equiangular)}$$