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
- <u>All necessary working should be shown in every question</u>

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

Rates and Proportion (8 marks)

<u>Question 1</u>

The distance time graph represents Emily's day out, riding her bicycle from her home on a farm into town and back home.
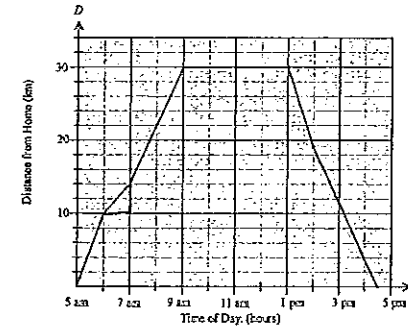
a) How long did Emily remain in town?(1)

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

<u>Question 2</u>

The amount of fertiliser needed for a paddock (F kg) is directly proportional to the area of the paddock (A m^2).

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 m^2)*(2)

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

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Bivariate Data (7 marks)

Question 3

Amount of Land Ice Relative to Long Term Average

.... Greenland   — — — Antarctica
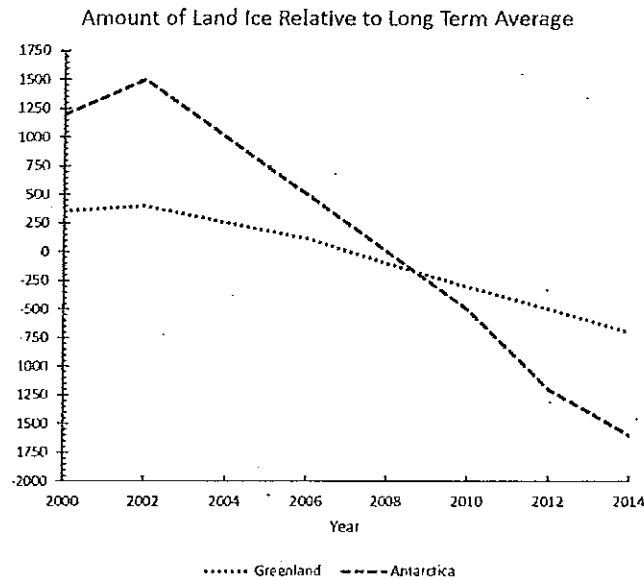
For the following questions, refer to the line graph above.
a) Circle the correct statement. (1)

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.

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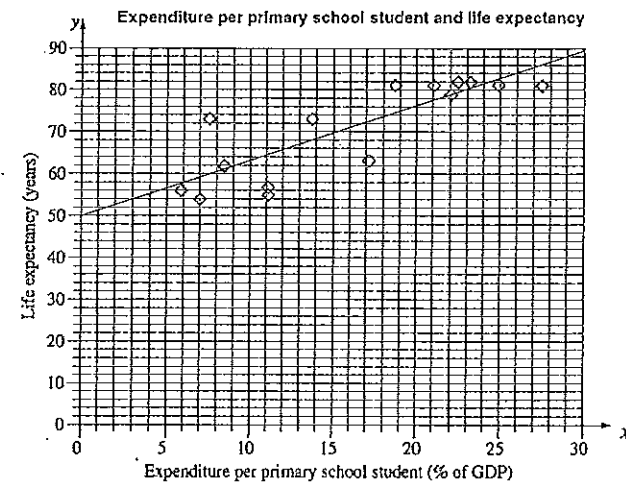
a) Describe the relationship between expenditure per primary school student and life expectancy.(1)

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_____

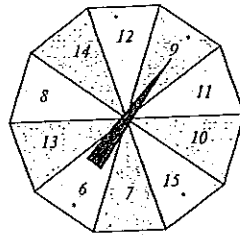b) Find the gradient of the line of best fit.(2)

_____

_____

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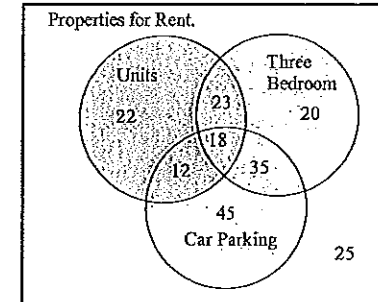Complete the two-way table to show the possible combinations he can choose from. (1)

	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)

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_____

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

_____
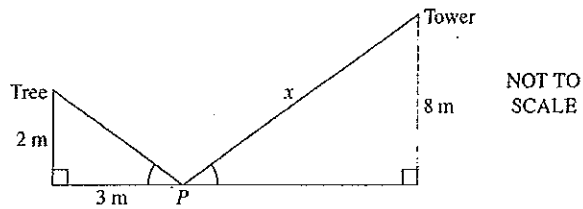
_____

Trigonometry (13 marks)

Question 9

For $\sin\theta = 0.1863$, find all possible values for θ where $0° < \theta < 180°$, 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.

NOT TO SCALE

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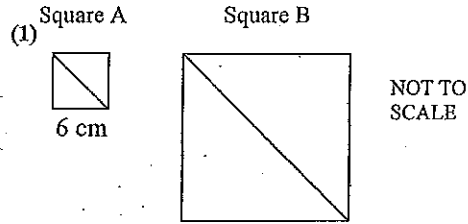
a) Draw a diagram representing this information.(2)

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.
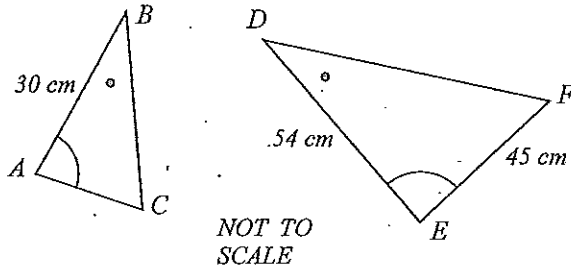
Find the side length of Square B. **(1)**

Square A   Square B

6 cm

NOT TO SCALE

_____

_____

Question 13

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

Find the length of AC.   **(2)**

30 cm

A   B   C

D   F   E

.54 cm   45 cm

NOT TO SCALE

_____

_____

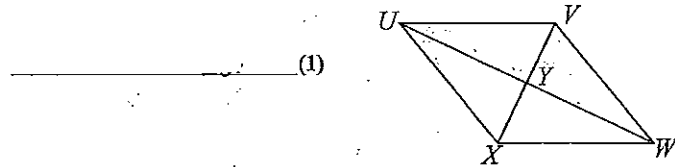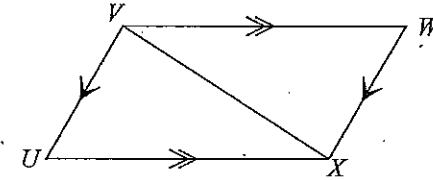### Question 14

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 $\triangle UVX \equiv \triangle WVX$?

_____ **(1)**

U   V   Y   X   W

Question 15

Given that $VW \parallel UX$ and $VU \parallel WX$. Prove that $\triangle UVX \equiv \triangle WXV$.   **(4)**

V   W   U   X

Question 16

For the diagram shown,

$KL \parallel ON$.
Prove that $\triangle MLK \parallel\!\parallel\!\parallel \triangle MON$.   **(3)**

K   L   M   N   O
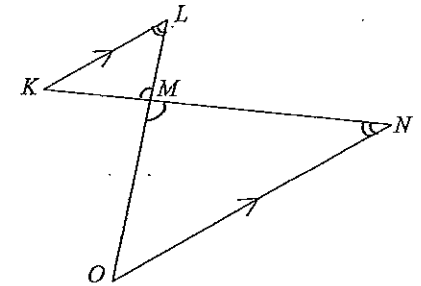
☺ END OF EXAMINATION ☺

St George Christian School

Yr 10 FINAL.   10B.

1. a) 4 hours. (9 am – 1pm)

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

Slope between 6-7am 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) $20(10000) = k85$

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

$k = 2353$ (nearest integer)

c) $A = 2353F$

$= 2353 (595)$

$\approx 1400000\,m^2$

$\approx 140\,Ha.$

Bivariate Data.

3 a) C (from graph)

b) A (2004 -2006 Antartica
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). $\dfrac{(y_2 - y_1)}{(x_2 - x_1)}$ take $(0,50)$ and $(30,90)$ as reference points

$\dfrac{90-50}{30-0} = m \Rightarrow \dfrac{40}{30} = m = \dfrac{4}{3}.$

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

$(y - 50) = m(x - 0)$
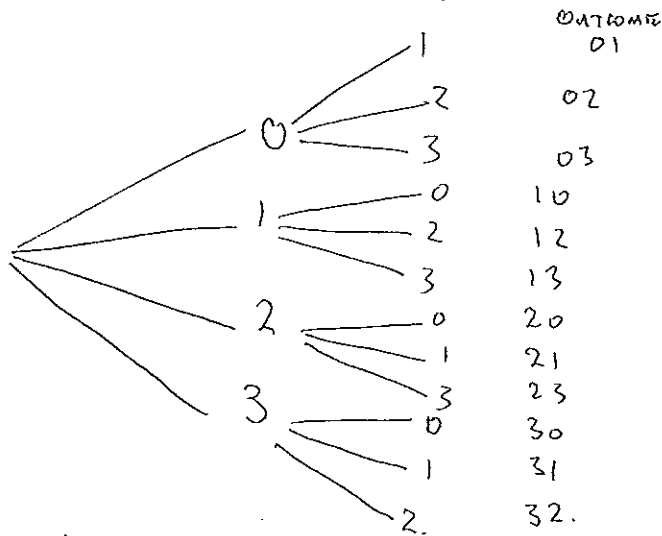
$y - 50 = \dfrac{4}{3}x$

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

Probability.

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

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

b) P (number of multiple 3) $= \{6,9,12,15\}$

$$= \frac{4}{10} = \frac{2}{5}$$

(2)

6.

	OUTCOME
1	01
2	02
3	03
0	10
2	12
3	13
0	20
1	21
3	23
0	30
1	31
2	32

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

7.

	SEDAN	HATCH	WAGON
Agua	Agua Sedan	Agua Hatch	Agua 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 OR SEDAN EXCEPT BURGUNDY SEDAN.

8. Properties For Rent.

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

Total number of 3 bedroom non units.
$$= 20+35 \text{ (2)}$$

Total number of car parking $=45$ (3)

(4)

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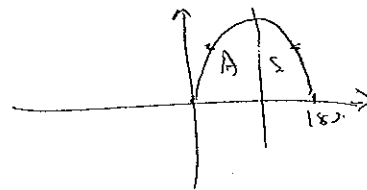
then $\frac{2}{3} = \tan\theta$

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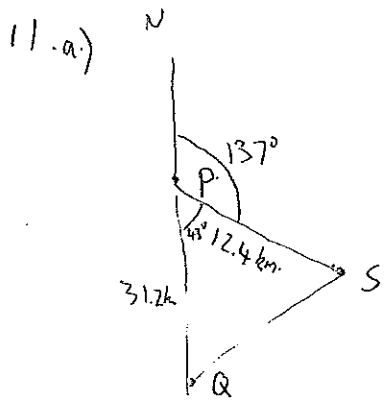
$\approx 33.7°$

$\frac{8}{x} = \sin\theta = \sin 33.7°$

$x \approx 14.42m$.

Can also use similar triangles. to find x.

$9\sin\theta = 0.1863$

In the domain $0 < \theta < 180°$

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

$\theta \approx 10.73°$ AND $169.26°$.

11.a)

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

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

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

$SQ \approx 23.7 \, km.$

lets call $\angle PQS = \text{'}x\text{'}$

$$\frac{23.7}{\sin 43°} = \frac{12.4}{\sin x.}$$

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

$$x \approx 20.9°.$$

∴ Bearing of the ship from Q
$$= 20.9°$$

⑤

12. → Properties of geometrical figures.

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

ORIGINAL SIZE   ENLARGEMENT FACTOR.

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

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

$$AC = 25 \, cm.$$

14. SSS Test

15. in $\triangle UVX$ and $\triangle WXV$.

$\angle UXV = \angle XVW$ (alternate)
$\angle VXV = \angle XVU$ (alternate)

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

XV is common in both triangles.

∴ we can use AAS Test
∴ $\triangle UVX \equiv \triangle WXV.$

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

$\angle LKN = \angle KNO$ (Alternate)
$\angle KLO = \angle LON$ (alternate).
$\angle KML = \angle OMN$ (vertically opposite)
∴ $\triangle MLK ||| \triangle MON$ (equiangular)

⑥