

Mathematics A

Thursday 25 October 2018

Paper One — Question and response book

9 am to 12:10 pm

Time allowed

- Perusal time: **10 minutes**
- Working time: **3 hours**

Examination materials provided

- Paper One — Question and response book
- Paper One — Resource book

Equipment allowed

- QCAA-approved equipment
- ruler (metric, parallel or rolling)
- protractor
- drawing compass
- set squares
- templates (without formulas)
- non-programmable calculator
- graphing calculator

Not allowed: Calculators with computer algebra system (CAS) functionality.

Directions

Do not write during perusal time.

Paper One has **four** extended-response questions.

Attempt **all** questions.

Assessment

Paper One assesses the following assessment criteria:

- Knowledge and procedures (KP)
- Modelling and problem solving (MP)
- Communication and justification (CJ)

Assessment standards are at the end of this book.

After the examination session

The supervisor will collect this book when you leave.

Candidate use

Print your candidate number here

1	8	-							-	
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Attach barcode here

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Number of books used

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Supervisor use only

Supervisor's initials

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QCAA use only

Marker number

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Paper One has **four** extended-response questions. Attempt **all** questions.

Write your responses in the spaces provided. **Show full working in all responses. Partial credit can only be awarded if working is shown.**

Additional pages for responses are at the back of this book.

Question 1

- a. Tom bought a ticket for an event for \$30, but could not go, so sold the ticket for \$21.

Calculate the percentage loss on the sale of the ticket.

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(KP)

- b. Sally worked as security at an event. Her normal rate of pay was \$26.40 per hour. Overtime is paid at time and a half for the first two hours over 38 hours, then double time thereafter.

Calculate Sally’s wage in a week when she worked for 60 hours.

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(KP)

c. i. Calculate the gross fortnightly wage for Anne who has annual earnings of \$124 897.

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(KP)

ii. Use the tax table below to calculate the amount of Anne’s fortnightly PAYG tax. Include in your calculation the Medicare levy of 2%.

Taxable income	Tax on this income
0–\$18 200	Nil
\$18 201–\$37 000	19¢ for each \$1 over \$18 200
\$37 001–\$87 000	\$3572 plus 32.5¢ for each \$1 over \$37 000
\$87 001–\$180 000	\$19 822 plus 37¢ for each \$1 over \$87 000
\$180 001 and over	\$54 232 plus 45¢ for each \$1 over \$180 000

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(KP)

iii. Anne has planned an overseas trip for her 4 weeks annual leave. The cost of the trip is \$9 150. She has paid a deposit of \$2 500.

Anne receives 17.5% holiday loading (which is free of tax) on her 4 weeks annual leave. She has weekly expenses of \$200.18 and union fees of \$11.70 that will continue while she is overseas.

Using only the **net pay** Anne will receive when she goes on her 4 weeks leave, determine if she will have sufficient money to finish paying for her overseas trip **and** have spending money while she is away.

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(MP)

- d. Jim sells second-hand cars on commission of 5%. Calculate the amount of commission Jim will receive if he sells cars to a total value of \$16 590.

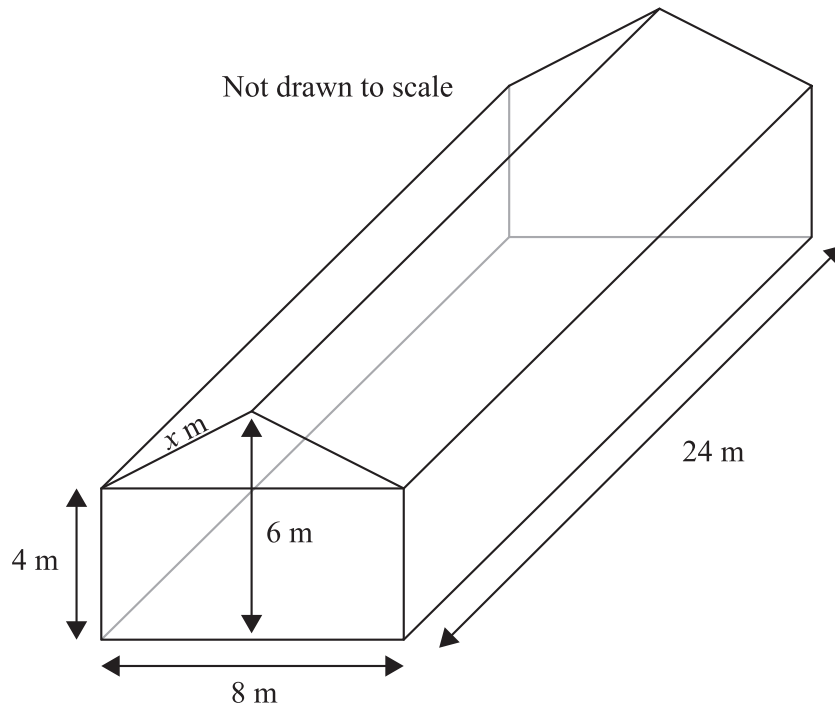
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..... (KP)

- e. A shop marks its shirts up by 45% of the wholesale price. These shirts were then sold at a 12.5% discount at the sale price of \$19. Calculate the original wholesale price of the shirts.

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Question 2

- a. The building shown in the diagram is 8 metres wide and 24 metres long. The side walls are 4 metres high. The peak of the roof is 6 metres vertically above the ground.



- i. Use Pythagoras' theorem to calculate the width of the roof panel x .

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(KP)

- ii. Calculate the total area of material needed to make the roof and all of the walls of this building.

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(KP)

b. A ramp to an entrance is 6 metres in length. The rise of the ramp is 70 centimetres.

Calculate the angle the ramp makes with the ground.

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(KP)

c. A plane at a height of 1 000 metres sights the runway at an angle of depression of 7° .

The plane continues flying at the same height towards the runway, which is later sighted at an angle of depression of 36° .

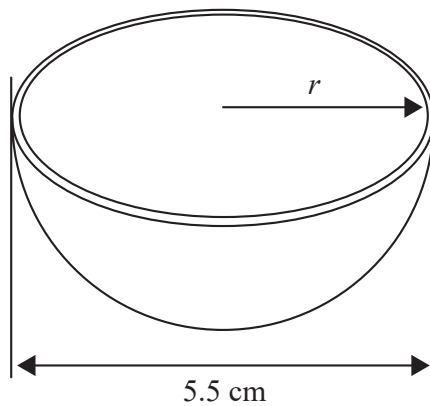
Calculate the distance that the plane travelled between sightings.

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(KP)

- d. A chocolate egg in the shape of a **sphere** has an external diameter of 5.5 cm. The chocolate has a thickness of 2 mm and the egg is hollow inside. The diagram below shows the egg cut in half.

Not drawn to scale.



The chocolate is 2 mm thick.

- i. What is the internal radius of the egg?

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(KP)

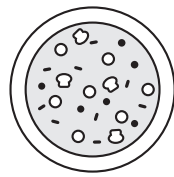
- ii. Calculate the volume of chocolate needed to make the whole egg.

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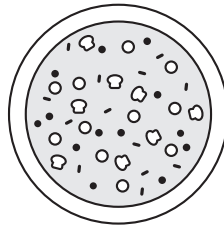
(KP)

e. Three different pizza sizes and their diameters are shown below. Every pizza has a height of 5 cm.

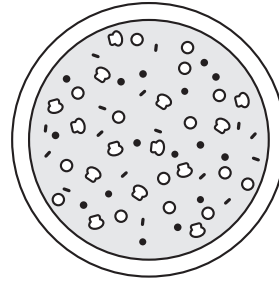
Not drawn to scale



Mini
15 cm diameter



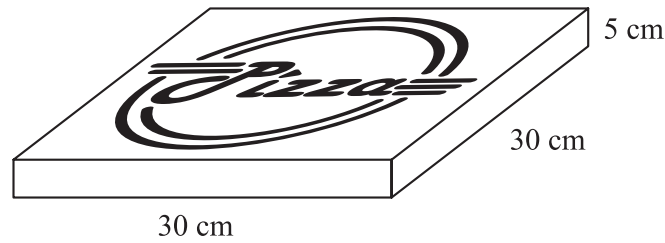
Standard
20 cm diameter



Large
25 cm diameter

A standard pizza box used for the large-size pizza has the dimensions shown.

Not drawn to scale



i. Calculate the volume of empty space when a large pizza is put in the pizza box.

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(KP)

f. i. Find the distance to the nearest kilometre between Washington DC (39° N, 77° W) in the United States and Lima (12° S, 77° W) in Peru.

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(KP)

ii. Toni lives in Vancouver (50° N, 122° W) and wants to ring her mother who lives in Lima. If Toni rings her mother at 8 am Vancouver time, what time is it in Lima?

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(KP)

- g.** A flight leaves Perth (32° S, 120° E) at 3 pm Wednesday bound for Cape Town (33° S, 15° E). It is an 8-hour flight time and arrives in Cape Town on schedule.
- i.** Calculate the arrival time of the plane in Cape Town.

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(KP)

The pilot leaves Cape Town exactly 26 hours after he arrived for the return flight to Perth. Because of tailwinds, this flight time is only 7 hours.

A passenger on this return flight has a meeting in Perth at 9 am Friday.

- ii.** Determine if the passenger will be on time for the meeting. Fully justify your decision with mathematical reasoning.

List **one strength** and **one limitation** of this scenario.

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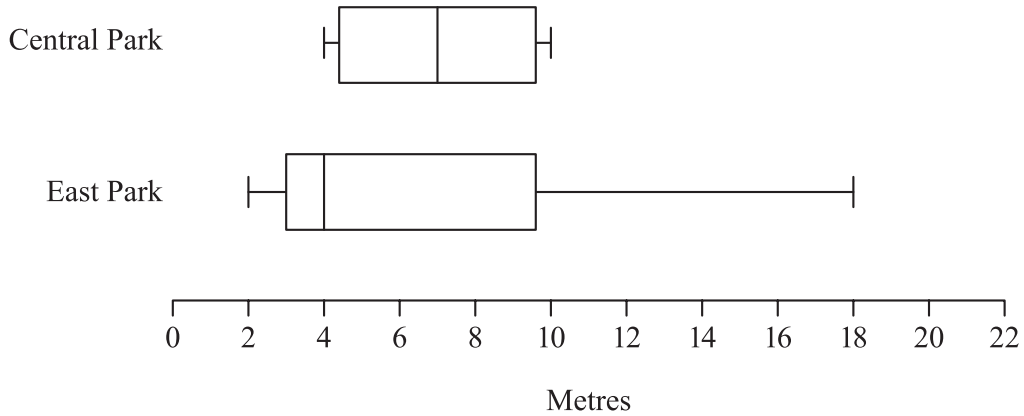
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(MP)

Question 3

a. The heights of trees in two large parks were measured and the data represented in the boxplots below.



Compare the range, median and interquartile distance of these two sets of data.

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(MP)

b. A group of people were surveyed and the results are summarised in the following table.

	Play tennis	Do not play tennis	Totals
Right-handed	53	81	
Left-handed	22	29	
Totals			

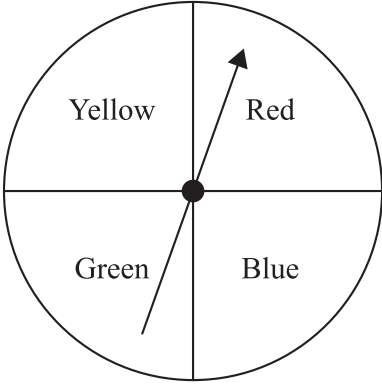
i. Complete the Totals row and column in the above table. (KP)

ii. Calculate the percentage of left-handed tennis players in this group of people.

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(KP)

c. The arrow is spun and will point to one of the four colours when it stops.



i. Draw a tree diagram to represent the outcomes when the arrow is spun twice.

(KP)

ii. What is the probability that the arrow points to the same colour both times it stops?

..... (KP)

Question 4

- a. i.** A fishing boat was travelling on a course of 200° T at 2 knots. At 1030 hours, the water tower at Beachmere is sighted at a bearing of 310° T.

When the boat anchors at 1130 hours, the same water tower has a bearing of 350° T.

Use the map on the opposite page to plot the position of the boat at 1130 hours and write these coordinates in the space below.

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..... (KP)

- ii.** Another fishing boat anchors at 1145 hours and sights the Clontarf water tower and the hospital chimney in transit. At the same time the boat sights the Deception Bay water tower at a bearing of 260° T.

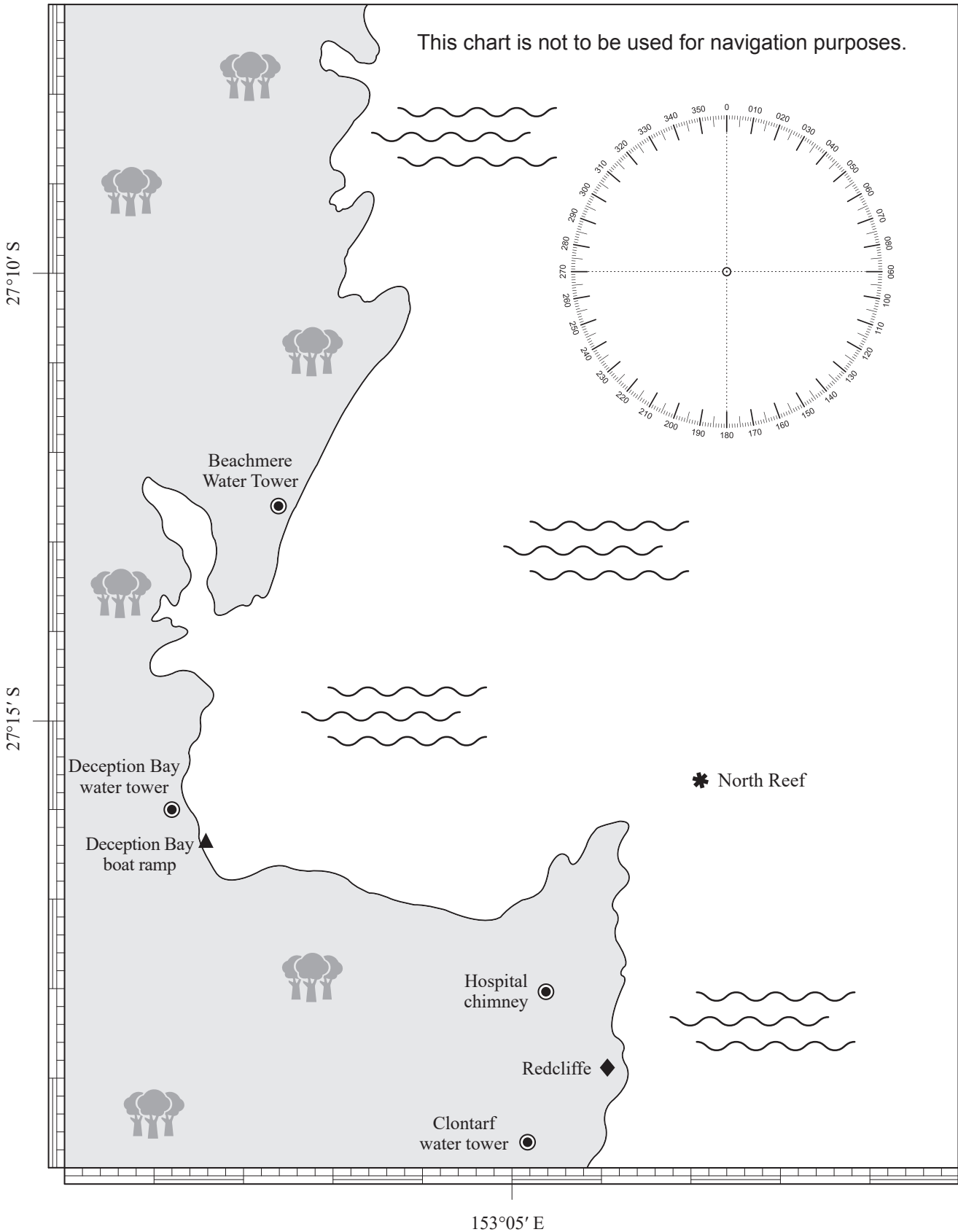
Use the map on the opposite page to plot the position of the second boat and write these coordinates in the space below.

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..... (KP)

- iii.** At 1400 hours both boats decide to move their positions. The first boat heads directly back to the Deception Bay boat ramp, while the second boat heads to North Reef for some more fishing. Both boats travel at 2 knots.

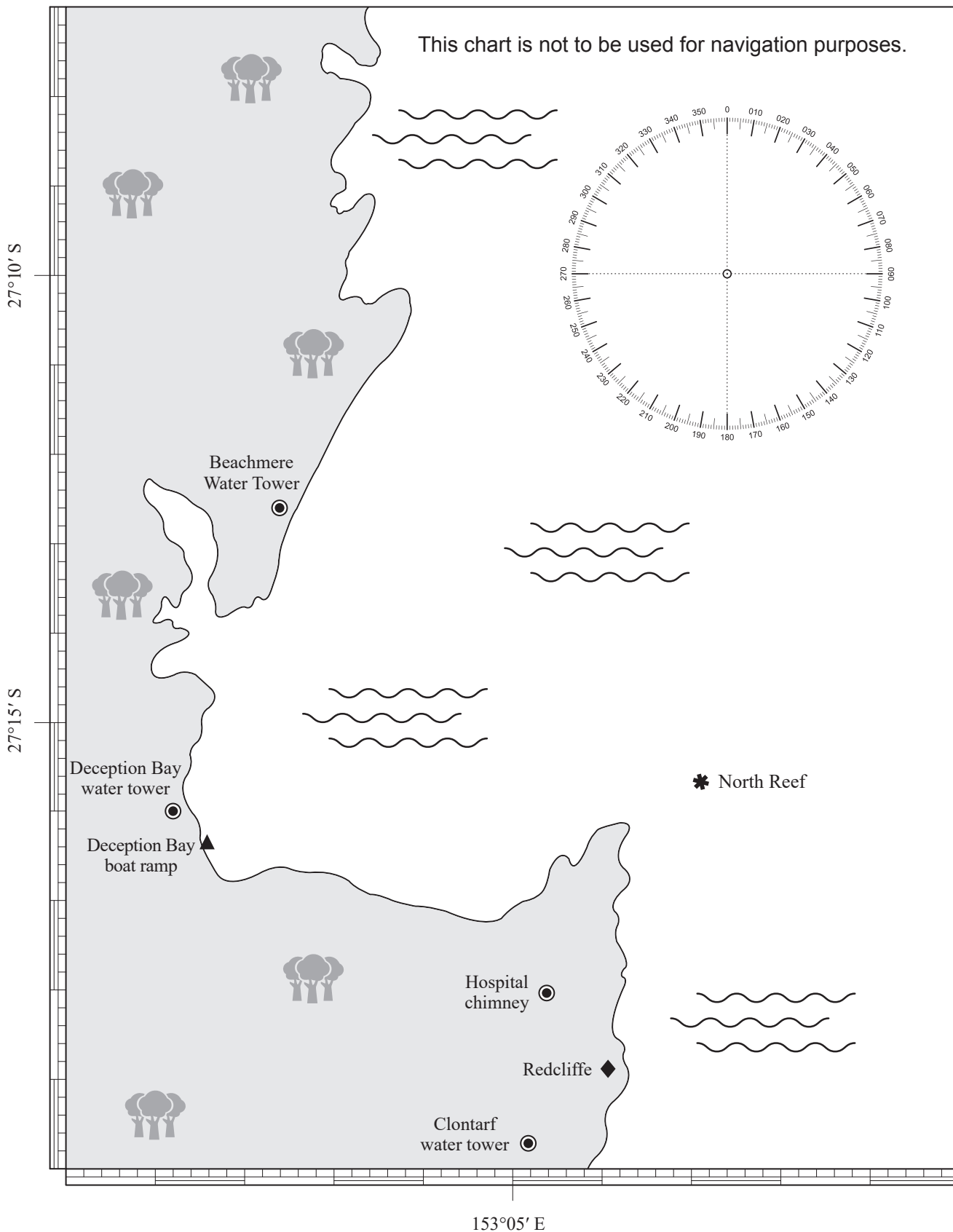
By comparing distances, determine which boat will reach its destination first. Justify your decision with mathematical reasoning.

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Spare map (if required)

This chart is not to be used for navigation purposes.



Assessment standards from the Mathematics A Senior External Syllabus 2006

Criterion	A	B	C	D	E
Knowledge and procedures (KP)	<p>The overall quality of a candidate's achievement across the full range within the contexts of application, technology and complexity, and across topics, consistently demonstrates:</p> <ul style="list-style-type: none"> • accurate recall, selection and use of definitions and rules • use of technology • recall and selection of procedures, and their accurate and proficient use. 	<p>The overall quality of a candidate's achievement across a range within the contexts of application, technology and complexity, and across topics, generally demonstrates:</p> <ul style="list-style-type: none"> • accurate recall, selection and use of definitions and rules • use of technology • recall and selection of procedures, and their accurate use. 	<p>The overall quality of a candidate's achievement in the contexts of application, technology and complexity, generally demonstrates:</p> <ul style="list-style-type: none"> • accurate recall and use of basic definitions and rules • use of some technology • accurate use of basic procedures. 	<p>The overall quality of a candidate's achievement in the contexts of application, technology and complexity, sometimes demonstrates:</p> <ul style="list-style-type: none"> • accurate recall and use of some definitions and rules • use of some technology. 	<p>The overall quality of a candidate's achievement rarely demonstrates knowledge and use of procedures.</p>
Modelling and problem solving (MP)	<p>The overall quality of a candidate's achievement across the full range within each context, and across topics, generally demonstrates mathematical thinking which includes:</p> <ul style="list-style-type: none"> • interpreting, clarifying and analysing a range of situations, and identifying variables • selecting and using effective strategies • informed decision making <p>... <i>and</i> sometimes demonstrates mathematical thinking which includes:</p> <ul style="list-style-type: none"> • selecting and using procedures to solve a wide range of problems • initiative in exploring the problem • recognising strengths and limitations of models. 	<p>The overall quality of a candidate's achievement across a range within each context, and across topics, generally demonstrates mathematical thinking which includes:</p> <ul style="list-style-type: none"> • interpreting, clarifying and analysing a range of situations, and identifying variables • selecting and using strategies ... <i>and</i> sometimes demonstrates mathematical thinking which includes: • selecting and using procedures required to solve a range of problems • informed decision making. 	<p>The overall quality of a candidate's achievement demonstrates mathematical thinking which includes:</p> <ul style="list-style-type: none"> • interpreting and clarifying a range of situations • selecting strategies and/or procedures. 	<p>The overall quality of a candidate's achievement demonstrates mathematical thinking which includes following basic procedures and/or using strategies.</p>	<p>The overall quality of a candidate's achievement rarely demonstrates mathematical thinking which includes following basic procedures and/or using strategies.</p>

(continued)

Criterion	A	B	C	D	E
<p>Communication and justification (CJ)</p>	<p>The overall quality of a candidate's achievement across the full range within each context consistently demonstrates:</p> <ul style="list-style-type: none"> • accurate use of mathematical terms and symbols • accurate use of language • organisation of information into various forms suitable for a given use • use of mathematical reasoning to develop logical arguments in support of conclusions, results and/ or decisions • justification of procedures. 	<p>The overall quality of a candidate's achievement across a range within each context generally demonstrates:</p> <ul style="list-style-type: none"> • accurate use of mathematical terms and symbols • accurate use of language • organisation of information into various forms suitable for a given use • use of mathematical reasoning to develop simple logical arguments in support of conclusions, results and/ or decisions. 	<p>The overall quality of a candidate's achievement in some contexts generally demonstrates:</p> <ul style="list-style-type: none"> • accurate use of basic mathematical terms and symbols • accurate use of basic language • organisation of information into various forms • use of some mathematical reasoning to develop simple logical arguments. 	<p>The overall quality of a candidate's achievement sometimes demonstrates evidence of the use of the basic conventions of language and mathematics.</p>	<p>The overall quality of a candidate's achievement rarely demonstrates use of the basic conventions of language or mathematics.</p>

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