



PEICAI SECONDARY SCHOOL
SECONDARY 4 NORMAL ACADEMIC
PRELIMINARY EXAMINATION 2020

CANDIDATE
NAME

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CLASS

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REGISTER NUMBER

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MATHEMATICS SYLLABUS A

Paper 2

4045/02

12 August 2020

2 hours

Candidates answer on Question Paper

READ THESE INSTRUCTIONS FIRST

Write your register number, class and name on all the work you hand in.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Section A

Answer **all** questions.

Section B

Answer **one** question.

The number of marks is given in brackets [] at the end of each question or part question.

If working is needed for any question it must be shown with the answer.

Omission of essential working will result in loss of marks.

The total number of marks for this paper is 60.

The use of an approved scientific calculator is expected, where appropriate.

If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.

For π , use either your calculator value or 3.142.

	AN notations	AC curacy	U nits
Marks Deducted	3	1	1

For Examiner's Use

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This document consists of **18** printed pages and **2** blank pages.

Setter: Mr. Francis Tan and Mr. Andy Chee

[Turn over

Mathematical Formulae*Compound Interest*

$$\text{Total Amount} = P \left(1 + \frac{r}{100} \right)^n$$

Mensuration

$$\text{Curved surface area of a cone} = \pi r l$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a cone} = \frac{1}{3} \pi r^2 h$$

$$\text{Volume of a sphere} = \frac{4}{3} \pi r^3$$

$$\text{Area of triangle } ABC = \frac{1}{2} ab \sin C$$

$$\text{Arc length} = r\theta, \text{ where } \theta \text{ is in radians}$$

$$\text{Sector area} = \frac{1}{2} r^2 \theta, \text{ where } \theta \text{ is in radians}$$

Trigonometry

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

$$a^2 = b^2 + c^2 - 2bc \cos A$$

Statistics

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$\text{Standard deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f} \right)^2}$$

Section A (52 marks)Answer **all** questions

- 1 (a) Express $\frac{4}{15}$ as a percentage.

Answer% [1]

- (b) Express 54.2% as a fraction.

Answer [1]

- 2 In March 2020, the Singapore Government announced a \$48 000 000 000 Resilience Budget in response to the COVID-19 pandemic.

- (a) Express 48 000 000 000 in standard form.

Answer [1]

In April 2020, with the worsening of the COVID-19 pandemic, the Singapore Government announced an increased budget of \$59 900 000 000 to help Singaporeans tide over the crisis.

- (b) Calculate the percentage increase in the Government's budget from March to April.

Answer % [2]

[Turn over

- 3** The sizes of the four angles in a quadrilateral are in the ratio 6 : 3 : 4 : 2.
Find the four angles of the quadrilateral.

Answer° ,° ,° ,° [4]

- 4** Factorise the following expressions completely.

(a) $3x^2 + x - 10$.

Answer [2]

(b) $5ab - 10a - 3b + 6$.

Answer [2]

- 5 (a) Express 126 as a product of prime factors.

Answer [2]

Given that $60 = 2^2 \times 3 \times 5$,

- (b) state the smallest integer a such that $60a$ is a perfect square.

Answer $a =$ [1]

- (c) find the lowest common multiple (LCM) of 60 and 126, leaving your answer as a product of prime factors.

Answer [1]

- 6 Timmy wants to invest \$40 000 over a period of 5 years.
The bank offers 2 plans for him.

Plan A offers 6.5% simple interest per annum.

Plan B offers 6% per annum compound interest compounded **monthly**.

Which plan is a better choice? Show your working clearly.

Answer

- 7 Simplify the following algebraic expressions, leaving your answer in positive index form.

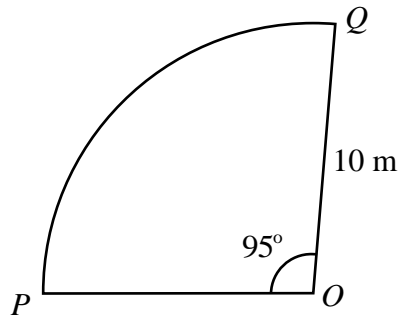
(a) $\frac{4x \times \sqrt{9x}}{3y}$.

Answer [2]

(b) $\left(\frac{2a}{3b}\right)^{-2} \div \frac{9bc^2}{4a}$.

Answer [3]

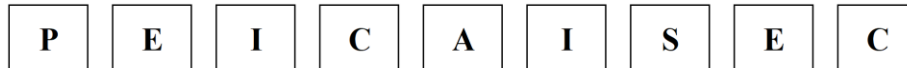
8 (a)



Peicai Secondary has a garden in the shape of a sector with radius 10 m as shown above. In order for the flowers to flourish in the garden, the school has decided to build a fence around the garden to keep away stray animals at night. Find the perimeter of the garden.

Answer m [2]

(b)



The letters of “PEICAI SEC” are written on cards as shown above.

One card is chosen at random.

Find the probability that the letter on the card is

(i) A ,

Answer [1]

(i) I ,

Answer [1]

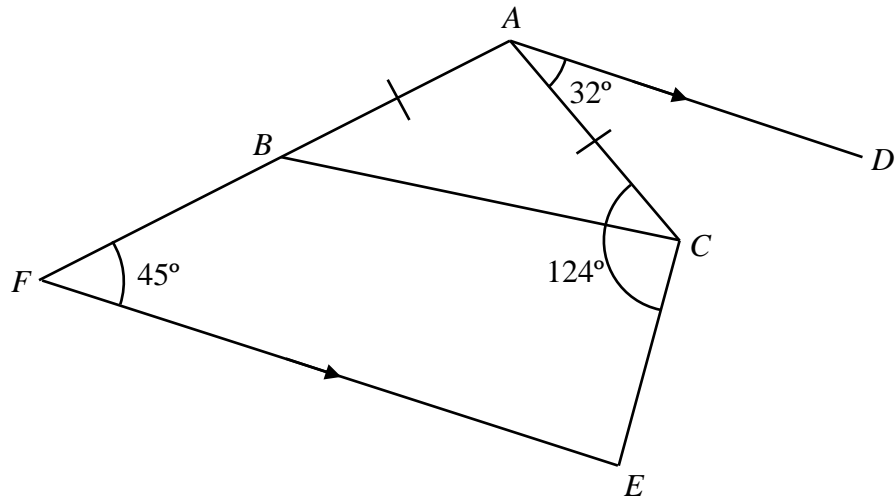
(i) M .

Answer [1]

- 9 (a) Find the value of a and b if $(x-6)^2 + (4-3x) = x^2 + ax + b$.

Answer $a = \dots\dots\dots$, $b = \dots\dots\dots$ [2]

- (b) In the diagram, ABC is an isosceles triangle with $AB = AC$.
 AD is parallel to FE . $\angle CAD = 32^\circ$, $\angle ACE = 124^\circ$ and $\angle AFE = 45^\circ$.



- (i) Calculate $\angle BAC$,

Answer $\dots\dots\dots^\circ$ [1]

- (ii) Calculate $\angle BCA$.

Answer $\dots\dots\dots^\circ$ [1]

- (iii) State, showing your reason, whether CE is perpendicular to FE .

Answer

[2]

- 10** The variables x and y are connected by the equation $y = x(x^2 - 6) + 2$.
Some corresponding values of x and y are given in the table below.

x	-3	-2	-1	0	1	2	3
y	p	6	7	2	-3	q	11

- (a) Calculate the value of p and the value of q .

Answer $p = \dots\dots\dots$

$q = \dots\dots\dots$ [2]

- (b) Using a scale of 2 cm to 1 unit for the x -axis, draw a horizontal axis for $-3 \leq x \leq 3$.
Using a scale of 2 cm to 2 unit for the y -axis, draw a vertical axis for $-8 \leq y \leq 12$.

Draw the graph of $y = x(x^2 - 6) + 2$ for $-3 \leq x \leq 3$ **using the gridlines provided in the next page.** [2]

- (c) Use your graph to find,
(i) the value of x when $y = -5$.

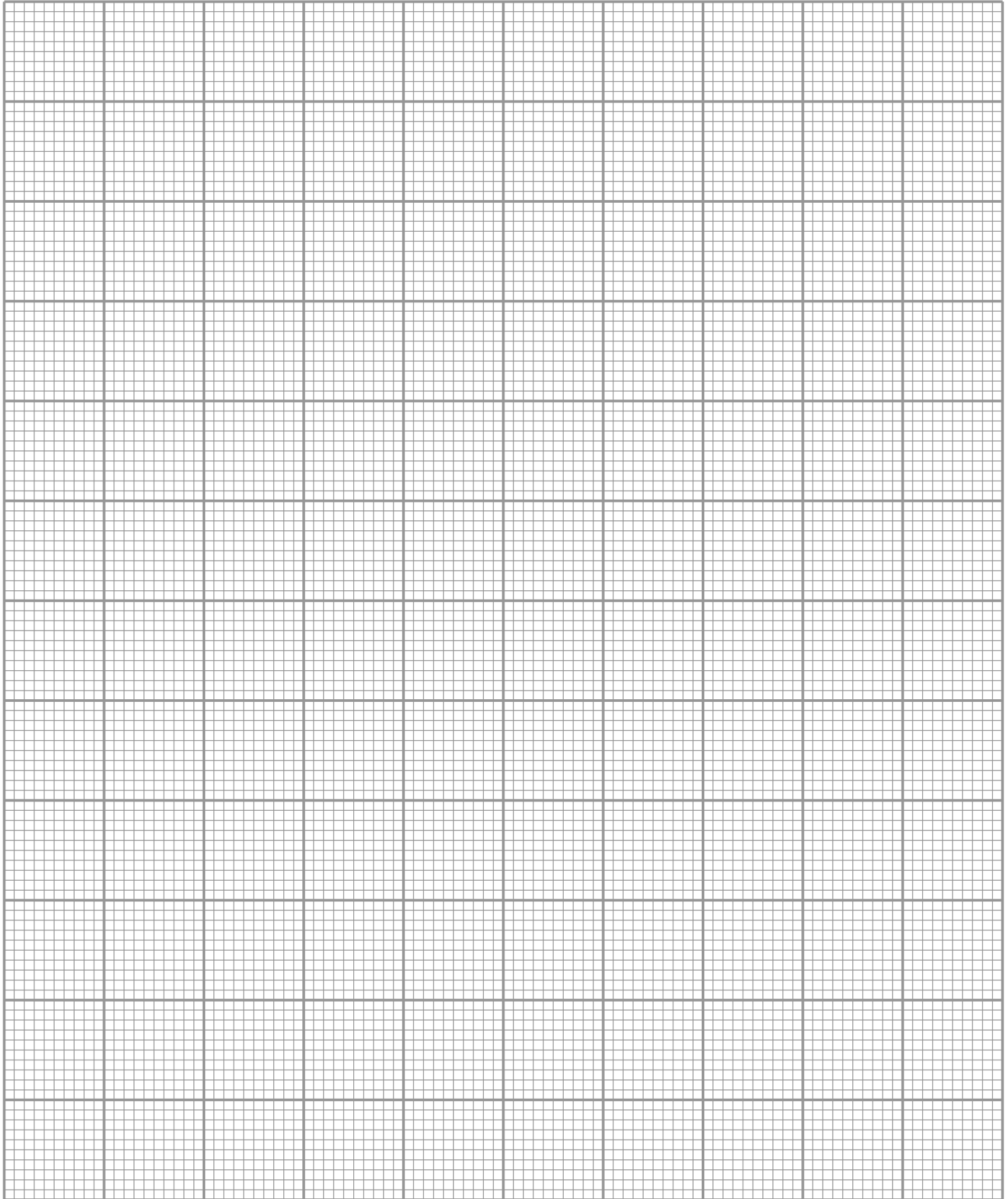
Answer $x = \dots\dots\dots$ [1]

- (ii) the smallest value of x when $y = 4$.

Answer $x = \dots\dots\dots$ [1]

- (d) By drawing a tangent, estimate the gradient of the graph when $x = 2$.

Answer $\dots\dots\dots$ [2]



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- 11 Mr. and Mrs. Tan decided to bring their two children of age 8 and 12 years-old to Bali, Indonesia during the December holidays, from 1 December 2020 to 3 December 2020.

Assuming that the COVID-19 situation has improved and overseas travel is allowed.



Mr. Tan found the following two flights information from www.skyscanner.com.

DPS is Denpasar International airport at Bali.

Option A:

	10:30 SIN	2h 50 → Direct	13:20 DPS	7 deals from \$229 \$916 total Select →
	22:20 DPS	2h 40 → Direct	01:00 ⁺¹ SIN	

Option B:

	15:20 SIN	2h 45 → Direct	18:05 DPS	7 deals from \$229 \$916 total Select →
	22:20 DPS	2h 40 → Direct	01:00 ⁺¹ SIN	

Mr. Tan would like to reach Bali by 4 pm.

- (a) Which Option will you advise Mr. Tan to choose? Justify your answer.

Answer

Mr. Tan found the following information online while planning for the holiday. The family intends to stay in one of the two accommodation below and visit the waterpark, Waterbom.

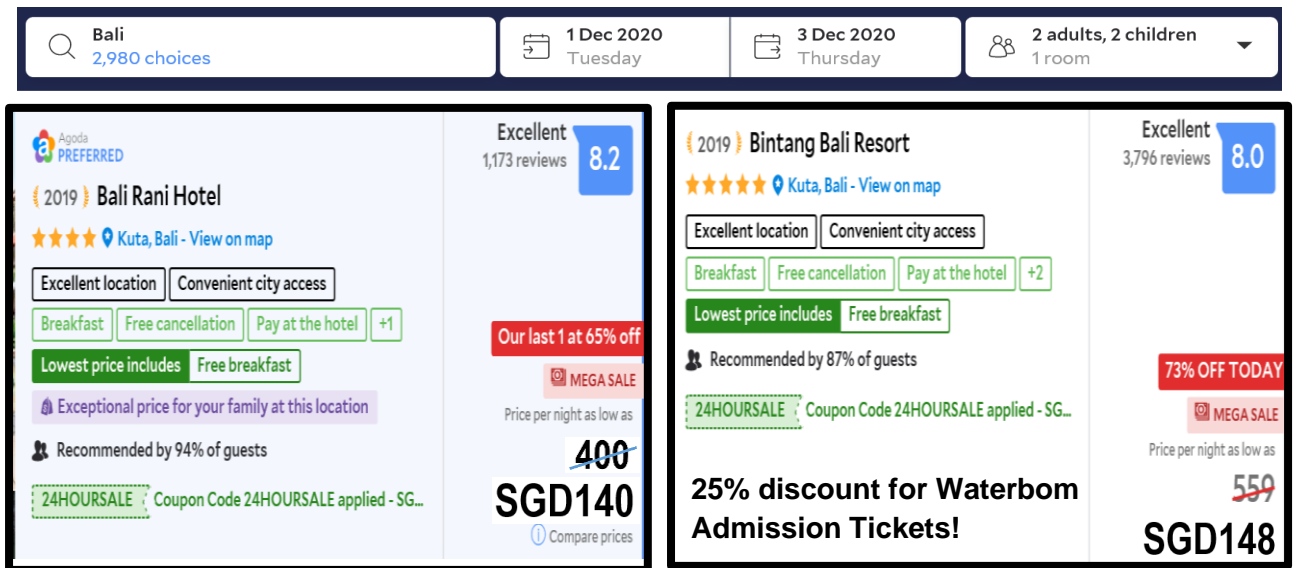


Figure 1. Accommodation information from www.agoda.com.

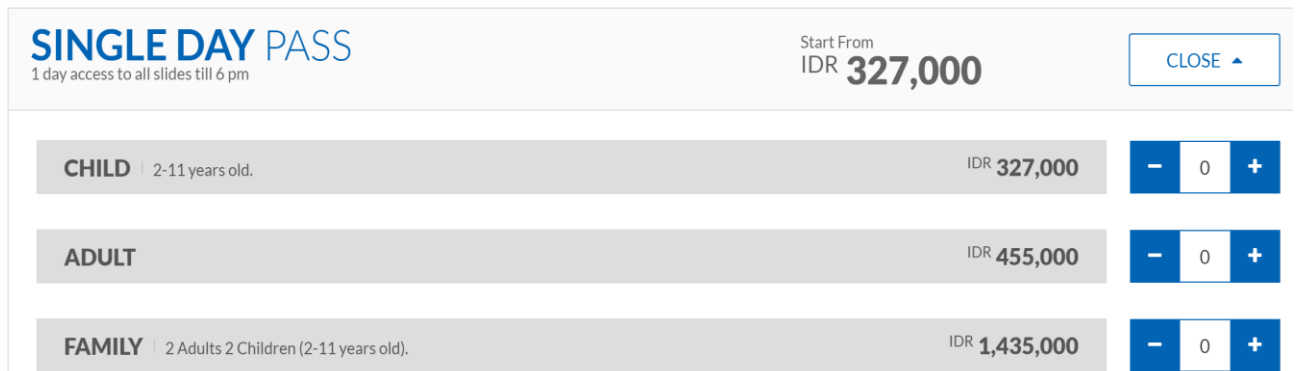


Figure 2. Waterbom Admission Ticket prices.

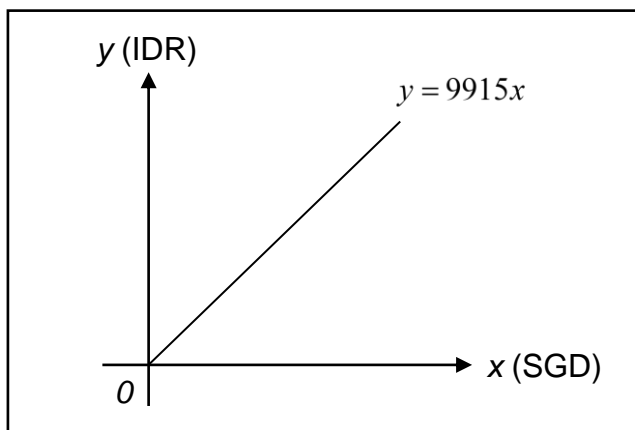


Figure 3. Exchange Rate between Singapore Dollars (SGD) and Indonesian Rupiah (IDR).

- (b) (i) The exchange rate between SGD and IDR is in the form $\text{IDR } 1000 = \text{SGD } k$. State the value of k .

Answer $k = \dots\dots\dots$ [1]

- (ii) Mr Tan intends to book the accommodation for 2 nights and purchase Single Day Pass of Waterbom admission tickets online for his whole family. Which accommodation allow him to **keep the total cost** (excluding food and transportation) under SGD \$430? Justify your answer and show your calculations clearly.

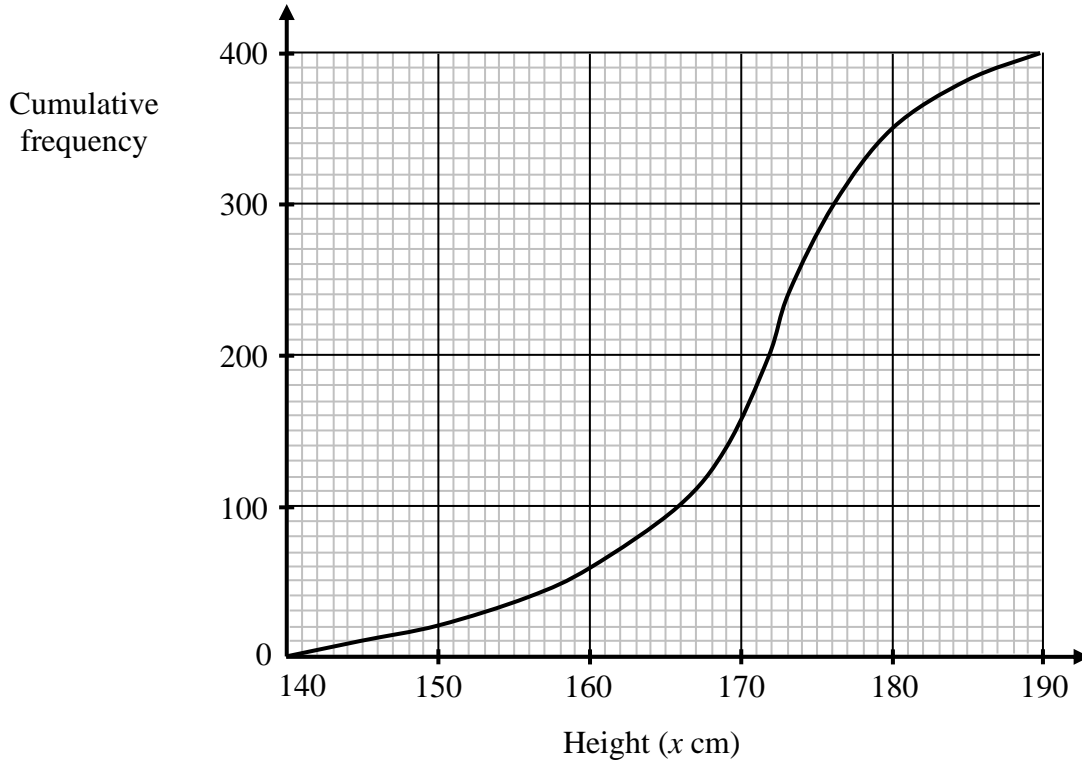
Answer

[6]

Section B (8 marks)

Answer **one** question from this section. Each question carries 8 marks.

- 12 (a)** The cumulative frequency curve below shows the height of 400 students from school A.



- (i)** State the median height.

Answer cm [1]

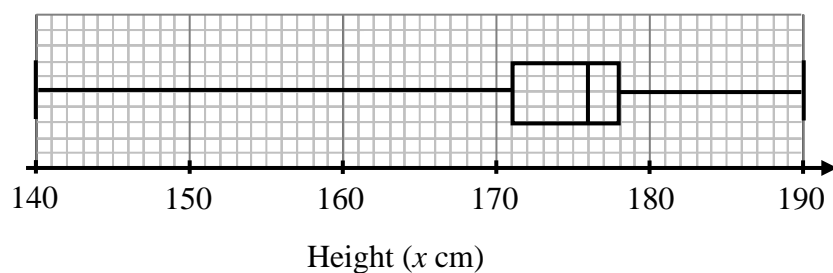
- (ii)** State the 80th percentile height.

Answer cm [1]

- (iii)** Calculate the interquartile range.

Answer cm [2]

- (b) The box-and-whisker plot below shows the height of 400 students in school *B*.



- (i) Write down the median height of students in school *B*.

Answer cm [1]

- (ii) Find the interquartile range.

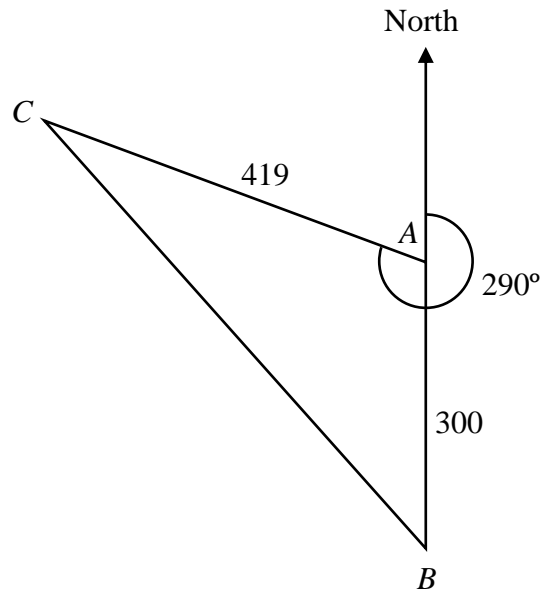
Answer cm [1]

- (iii) Olivia commented that the students in school *A* are shorter than the students in school *B*.
Do you agree? Give a reason for your answer.

Answer

[2]

- 13 (a)** A boat sails 300 km due south from A to B . It then sails north-west to C . The distance from C to A is 419 km and the bearing of C from A is 290° .



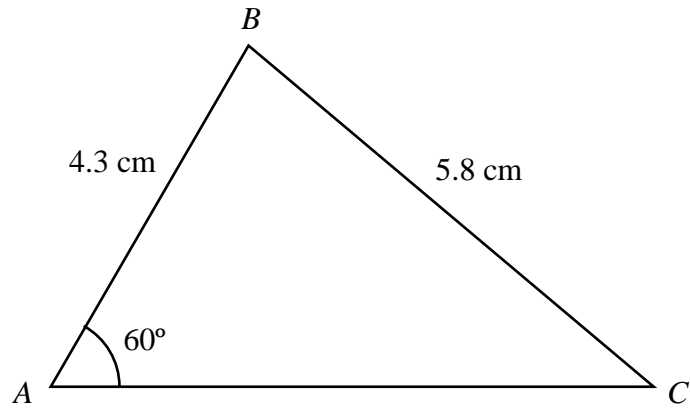
- (i) What is the bearing of A from B ?

Answer $^\circ$ [1]

- (ii) Calculate the distance BC .

Answer $BC = \dots\dots\dots$ km [3]

(b)



In the diagram, $AB = 4.3$ cm, $BC = 5.8$ cm and angle $BAC = 60^\circ$.

(i) Find the angle ACB .

Answer angle $ACB = \dots\dots\dots^\circ$ [2]

(ii) Find the area of triangle ABC .

Answer $\dots\dots\dots$ cm² [2]

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