Name:	Class:	Register No.:

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number 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.

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 70.

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.

For Examiner's Use
/ 70

This document consists of **21** printed pages.

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 (62 marks)

Answer **all** the questions in this section.

1 **(a)** Calculate $\dfrac{\sqrt{5.3}+3.9^2}{2.5}$.

Answer …………...…..………… [1]

(b) **(i)** Write 0.000 002 589 in standard form.

Answer …………...…..…………. [1]

(ii) The population of Singapore in 2023 is 5.97×10^6 .

The area of Singapore is 7.34×10^2 km^2.

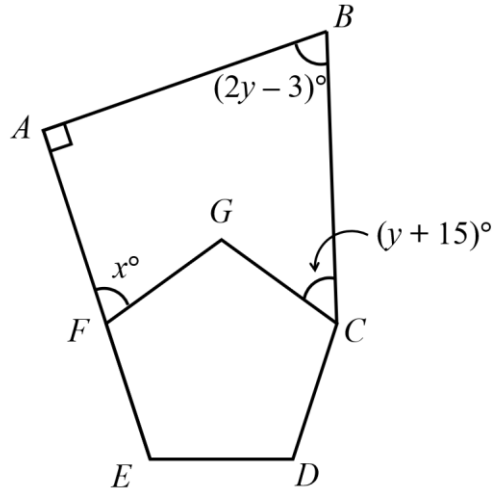Calculate the average number of people per square kilometre in Singapore in 2023. Give your answer in standard form.

Answer …………...…..…………. [2]

2   The diagram shows a pentagon *ABCDE*.

AFE is a straight line and *CDEFG* is a regular pentagon.

Angle *BAF* = 90°.

Find *x* and *y*.

Answer   *x* = ...…………………….

y = …………….…....…… [5]

[Turn over

3 **(a)** The eye colour of the students in Class 1A and Class 1B are summarised on the accurate pie charts below.

<p align="center">Eye colour of students by class</p>
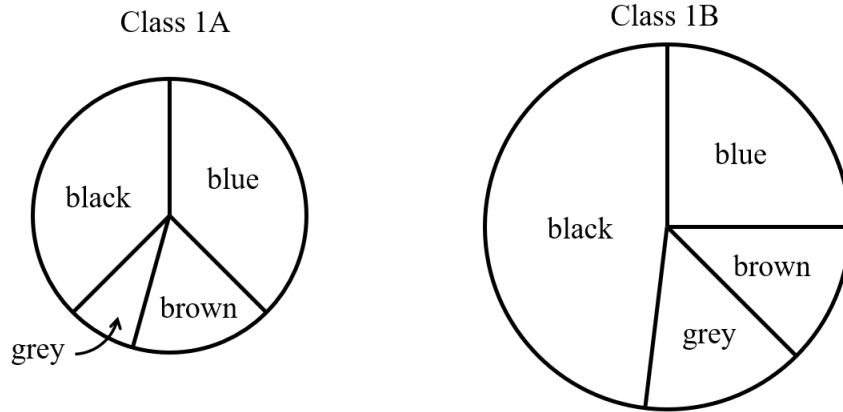
Class 1A

Class 1B

(i) 'Class 1A has more students with blue eyes than Class 1B.'

Explain why this statement might be false.

Answer ………….………………………...…………...….…………

……..……………………………………………………….. [1]

(ii) There are 3 students with grey eyes in Class 1A.

How many students are there in Class 1A?

Answer …………...…..……...…… [2]

(iii) What percentage of the students in Class 1B have brown eyes?

Answer …………...…..……….. % [2]

[Turn over

(b) The students of Class 1C took a Math test.

The total marks were 30.

The stem-and-leaf diagram shows their results.

```
0 | 8 9

1 | 2 5 5 6 8 8

2 | 1 3 4 4 6 7 7 7 8 9

3 | 0 0
```

Key   0 | 8   means 08

(i) Find the median mark.

Answer …………...…..…………. [1]

(ii) Calculate the mean mark.

Answer …………...…..…………. [2]

(iii) One student is chosen at random from Class 1C.

Find the probability that the student scored more than 25 marks.

Answer …………...…..…………. [2]

[Turn over

4 The diagram shows the cross-section of a hemispherical bowl of radius 17 cm.
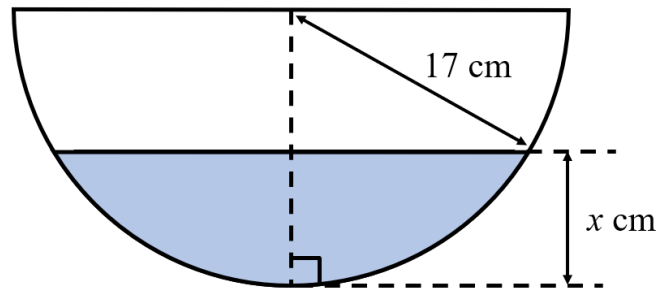
Water is poured into the bowl to a depth of x cm.

Given that the area of the surface of the water is 225π cm^2, find the value of x.

Answer $x =$ ..………..…..…………. [4]

5 A map is drawn to a scale of 1 : 60 000.

   (a) This scale can be written as 1 cm to n km.

   Find n.

Answer $n =$ …..…..…..…………. [1]

   (b) A road on the map is 13 cm long.

   Calculate the actual length of the road in kilometres.

Answer   …..…..…..…………. km [1]

   (c) A ranch has an area of 4.8 km^2.

   Find the area of the ranch on the map in square centimetres.

Answer   …..…..…...…..………. cm^2 [2]

6 Use factorisation to solve $5x^2 + 6x - 8 = 0$.

Show your working.

Answer x = ……..…. or x = …….. [3]

[Turn over

7 The diagram shows a solid made from a cylinder and a cone.

The cylinder and cone each have a radius of 12 cm.

The cylinder has a height of 8 cm and the cone has a height of 5 cm.
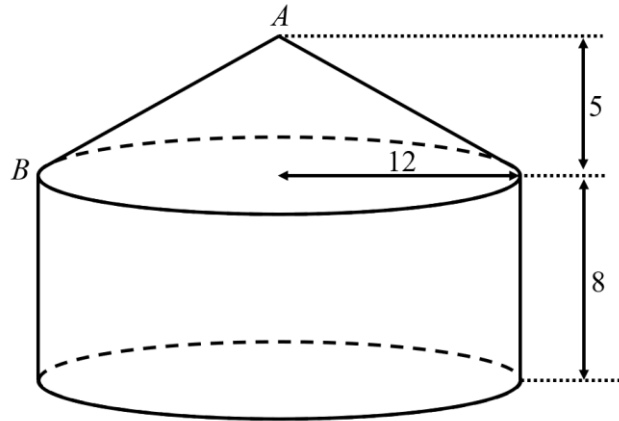
(a) Calculate the volume of the solid.

Answer …..…...…..……..….. cm^3 [3]

(b) Find the slant height, *AB*, of the cone.

Answer …..……..……........…. cm [1]

(c) Calculate the total surface area of the solid.

Answer …..……..………...….. cm^2 [4]

[Turn over

8 *A* is the point (–2, 5) and *B* is the point (4, 2).
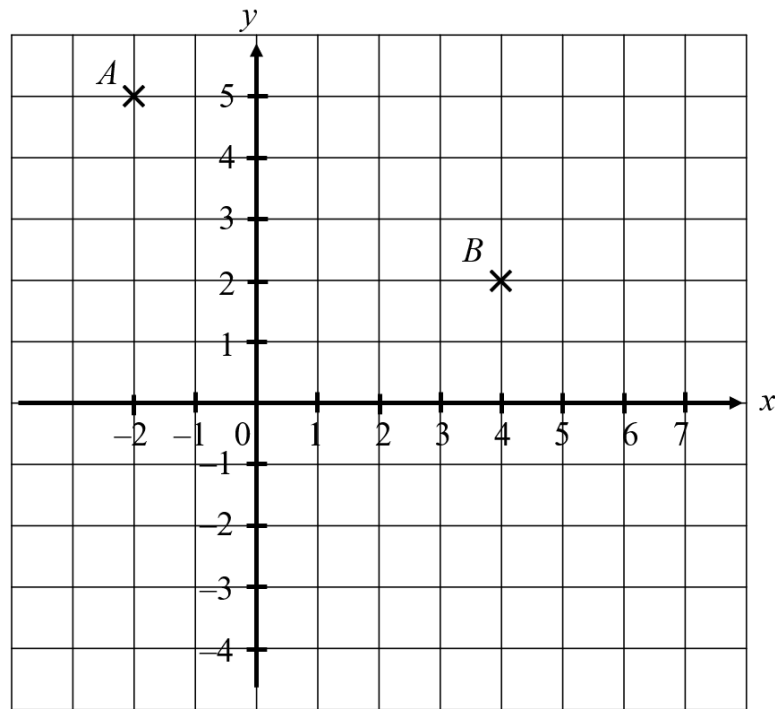
(a) Calculate the length *AB*.

Answer   …..…......….…….….… units [1]

(b) Find the equation of the line *AB*.

Answer   …..……..….…………….... [1]

(c) *M* is a point on the line *AB* such that *AM* = *BM*.
Find the coordinates of *M*.

Answer   …..……..….…………….... [1]

[Turn over

(d) *C* is the point (7, –4).

ABCD is a parallelogram.

(i) Find the coordinates of the point *D*.

Answer …..…....…..…………… [1]

(ii) Claire claims that *ABCD* is a rhombus.

Is she correct?

Show the calculations and reason on which you base your answer. [2]

Answer

(iii) Find the area of *ABCD*.

Answer …..…....…..…..… units^2 [2]

9 **(a)** Complete the table of values for $y = x^3 - 3x^2 + 1$. [1]

x	-2	-1	0	1	2	3	4
y	-19		1	-1	-3	1	17

(b) Draw the graph of $y = x^3 - 3x^2 + 1$ for $-2 \leq x \leq 4$. [3]

Answer

[Turn over
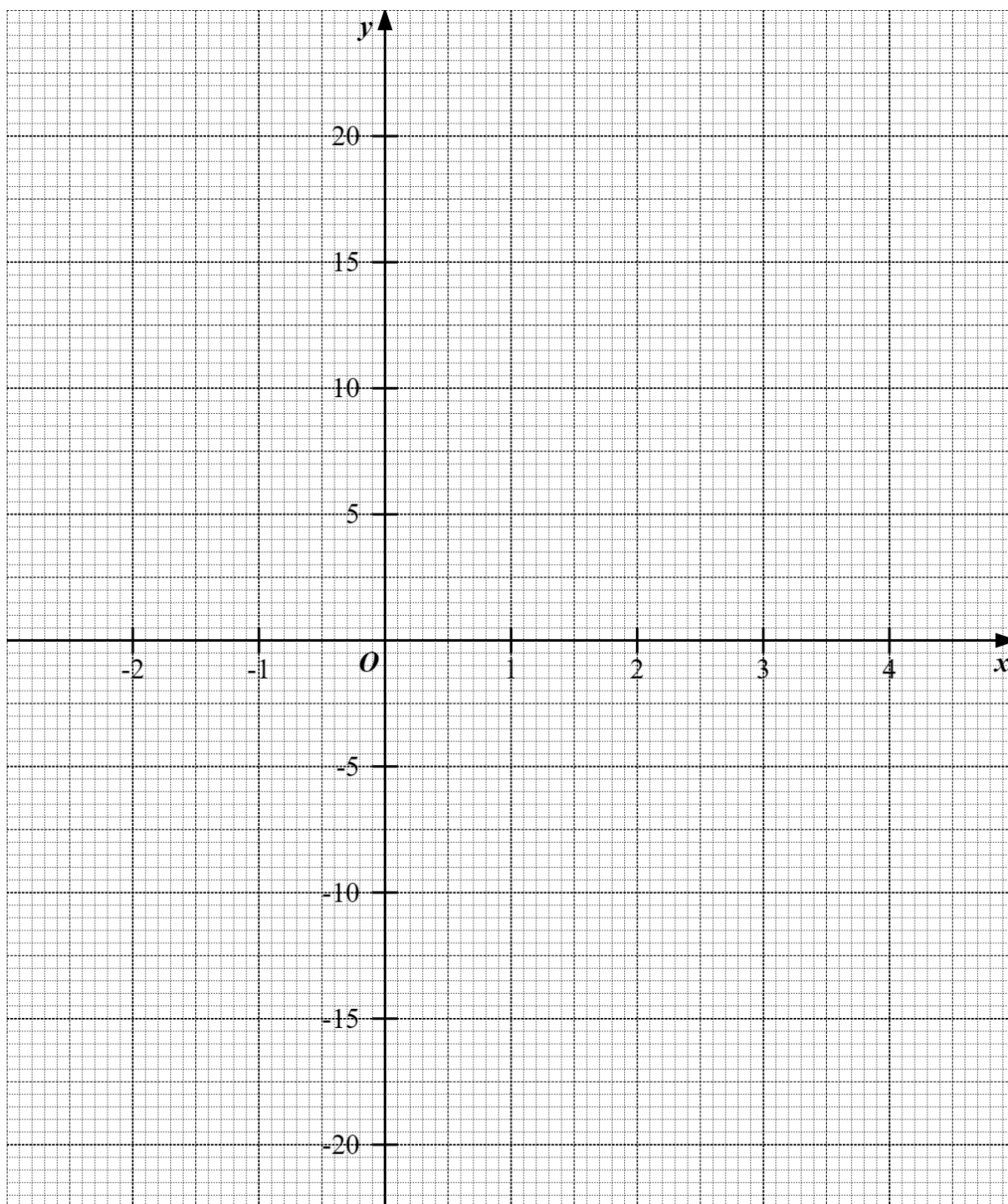
(c) Using your graph, estimate

    (i) the value of y when $x = 1.5$,

Answer $y = $ ...……...…………... [1]

    (ii) the value of x when $y = -10$.

Answer $x = $ .....……...…………... [1]

(d) By drawing a suitable tangent, find the gradient of the curve when $x = 2$.

Answer ...…………………...…… [2]

[Turn over

10 James and Susan are preparing for a triathlon.

The triathlon comprises three stages, swimming, cycling and running.

The tables below provide information about the triathlon.

Stages	Distance
Swim	1500 m
Cycle	40 km
Run	10 km

	Cumulative timings (x)	
	Male	Female
Gold	$x < 2$ h 10 min	$x < 2$ h 40 min
Silver	2 h 10 min $\leq x < 2$ h 30 min	2 h 40 min $\leq x < 3$ h 00 min
Bronze	2 h 30 min $\leq x < 2$ h 50 min	3 h 00 min $\leq x < 3$ h 20 min
Consolation	$x \geq 2$ h 50 min	$x \geq 3$ h 20 min

(a) Calculate the total distance covered, in kilometres, during the triathlon.

Answer ...…..…..…………... km [1]

(b) James's average time for completing the three stages is 135 minutes.

State the award that James can obtain.

Answer ...…..…..…………......... [1]

	Average speed (km / h) (y)		
	Swimming	Cycling	Running
With intense training	$3 < y \le 5$	$22 < y \le 30$	$8 < y \le 11.9$
Without intense training	$0 < y \le 3$	$0 < y \le 22$	$0 < y \le 8$

From past triathlons, the range of Susan's average speed for each of the stages is in the table above. Due to time constraints, Susan only has time to train intensely for one of the sports, which will allow her to improve her speed.

(c) Calculate the shortest amount of time, in hours, Susan requires to complete the cycling stage without intense training. Leave your answer in exact form.

Answer …..…...……………….. h [2]

(d) Susan plans to train intensively for either swimming or running.

Which should she decide on? Justify your decision with calculations. [4]

Answer

[Turn over

Section B (8 marks)

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

11 (a) The table summarises the heights of students in Class A.

Height (cm)	$140 < x \leq 150$	$150 < x \leq 160$	$160 < x \leq 170$	$170 < x \leq 180$	$180 < x \leq 190$
Frequency	2	11	18	6	3

(i) Calculate an estimate of the mean of these heights.

Answer ...…..…..……....……. cm [1]

(ii) Find an estimate of the standard deviation of these heights.

Answer ...…..…..……....……. cm [1]

The mean height of the students in Class B is 169.3 cm and the standard deviation is 7.8 cm.

(iii) In which class are the students taller on average?

Give a reason for your answer.

Answer Class ..…… because …..…………………………………... [1]

(iv) In which class are the heights of the students more consistent?

Give a reason for your answer.

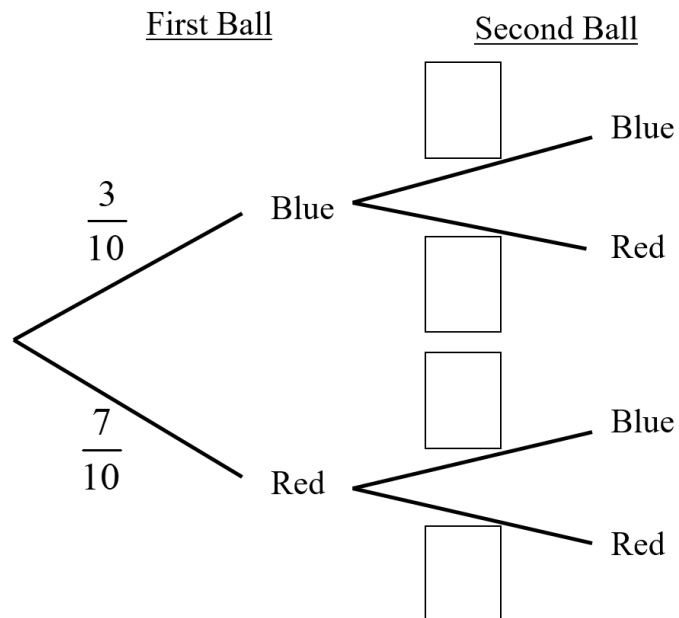*Answer* Class ..…… because …..……………………………..…….. [1]

[Turn over

(b) A bag contains 3 blue balls and 7 red balls.

Two balls are picked from the bag without replacement.

(i) The probability tree diagram is drawn below.
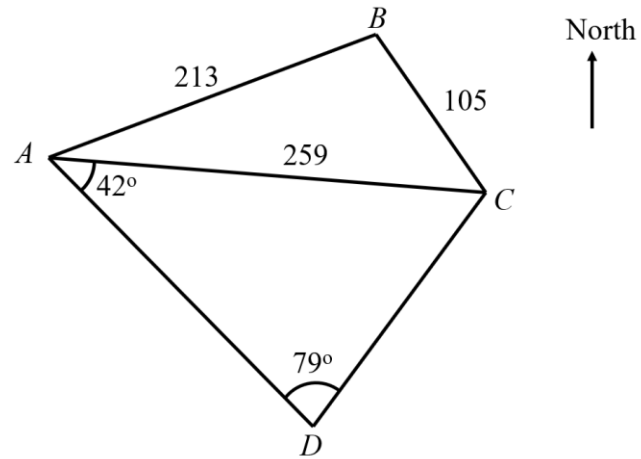
Fill in the blanks. [2]

First Ball   Second Ball

$\dfrac{3}{10}$ Blue

Blue

Red

$\dfrac{7}{10}$ Red

Blue

Red

(ii) Find the probability that the balls are of different colours.

Answer …….…..…..……………... [2]

12

A, B, C and D are four towns.

AB = 213 km, BC = 105 km and AC = 259 km.

Angle CAD = 42º and angle ADC = 79º.

(a) Show that the obtuse angle ABC = 103.8º, correct to 1 decimal place. [3]

Answer

(b) Calculate CD.

Answer …..…..…..………..... km [2]

[Turn over

(b) The bearing of Town *D* from Town *A* is 135º.

Calculate the bearing of Town *D* from Town *C*.

Answer …..…...…..….……...….. º [3]

End of Paper

Setter: Miss Melody Ho