TANGLIN SECONDARY SCHOOL

PRELIMINARY EXAMINATION 2020
Secondary 4 Normal (Academic)

NAME			
CLASS		**INDEX NO.**	

Mathematics Syllabus A — 4045/02

Paper 2 — **2 hours**

Candidates to write answers on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your index number 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, highlighters, 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 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 , use either your calculator value or 3.142.

For Examiner's Use	
Total	60

This document consists of **19** printed pages and **1** blank page.

Mathematical Formulae

Compound Interest

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

Mensuration

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

Curved surface area of a sphere = $4\pi r^2$

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

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

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

Arc length = $r\theta$, where θ is in radians

Sector area = $\frac{1}{2}r^2\theta$, where θ 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

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

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

Section A (52 marks)
Answer **all** questions in this section.

1 Some facts about the Loch Ness are shown in the poster below.

- Loch Ness is a large, deep, freshwater lake in the Scottish Highlands.
- Its deepest point is 230 000 cm.
- Loch Ness has a volume of 7.5 km^3.
- Brenda Sherratt was the first person to swim 36.2 km along the

(a) Express the depth of the lake in standard form.

Answer…… [1]

(b) Express the volume of the lake in cubic metres, m^3, leaving your answer in standard form.

Answer…… [2]

(c) How many hours did Brenda Sherratt take to swim across the lake?

Answer…… [1]

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2 (a) Calculate $\sqrt[3]{0.00075 + 0.001456}$.

Answer…… [1]

(b) By rounding of each number to 1 significant figure, estimate the value of

$$\frac{0.0054 \times 2.83^2}{12.4}.$$

Answer…… [2]

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3 **(a)** The interior angle of an $(n+7)$ -sided regular polygon is 156°.
Find the value of n.

Answer…… [3]

(b) Solve the simultaneous equations,

$$6x + 5y = 7$$
$$6x + 2y = 10$$

Answer $x =$ ……,

$y =$ …… [3]

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4 In 2016, Sara's annual salary was \$24 190.
This was an increase of 2.5% of her annual salary in 2015.

(a) Calculate her annual salary in 2015.

Answer \$…… [2]

(b) The income tax rates for 2016 are shown below.

First	\$20 000	Rate: 0%
Next	\$10 000	Rate: 2%

Calculate the amount of income tax Sara paid in 2016.

Answer \$…… [1]

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5 **(a)** Express $m^2 - 6m - 20$ in the form of $(m+h)^2 + k$ where h and k are constants.

Answer …… [2]

(b) Hence, solve $m^2 - 6m - 20 = 0$.

Answer m =……..… or ……..……. [2]

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6 **(a)** Factorise $x^2 - 16$.

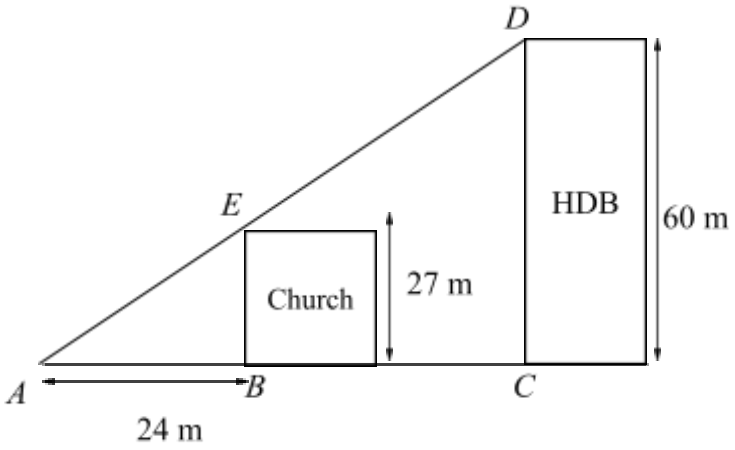
Answer …… [1]

(b) Simplify $\frac{x^2 - x - 12}{x^2 - 16} \div \frac{x - 6}{x + 4}$.

Answer …… [3]

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7 In the diagram, a 60 m tall HDB flat casts a shadow AC on level ground.
At the same time, a 27 m tall church casts a shadow, AB, 24 m long.



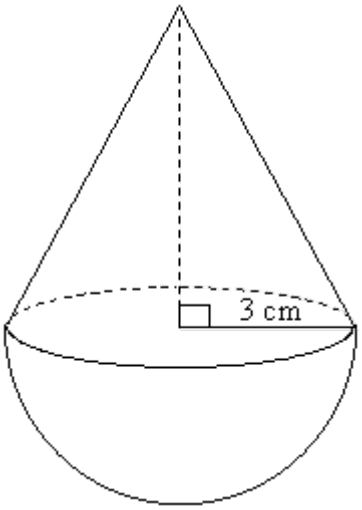
(a) Show that the angle of depression of point A on the ground from the top of the church is 48.4^o .

[2]

(b) Find the length of the shadow of the HDB flat.

Answer ……m [2]

8 The diagram below shows a toy made by joining the plane surfaces of a cone and a hemisphere of radius 3 cm.



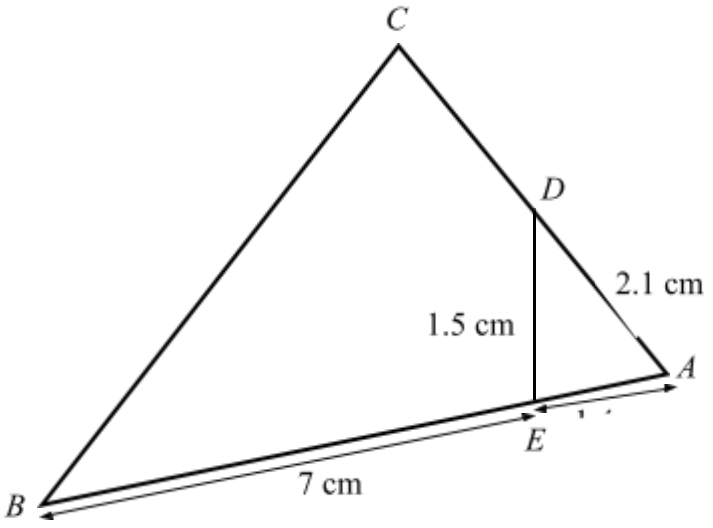
(a) Given that the volume of the cone is 150 cm^3, show that the height of the cone is 15.9 cm.

[2]

(b) Find the total surface area of the toy.

Answer ……cm^2 [3]

9 **(a)** In the diagram below, triangle *ABC* is similar to triangle *ADE*.



Find the length of *BC*.

Answer ……cm [2]

(b) In the month of May, Joel's household used 300 units of electricity, 25 units of gas and 30 units of water.

The utility rates for electricity, gas and water for household use is as follows:

Utilities	Charges
Electricity	\$0.2306 per unit
Gas	\$0.0961 per unit
Water	\$0.55 per unit for the first 20 units. \$0.85 per unit for each subsequent unit

*7% GST on total utilities bill.

Calculate how much Joel paid for his utilities bill in the month of May.

.

Answer \$..... [3]

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10 This table of values is for $y = 25 + 4x - 3x^2$.

x	-3	-2	-1	0	1	2	3
y	-14	5	p	25	26	21	q

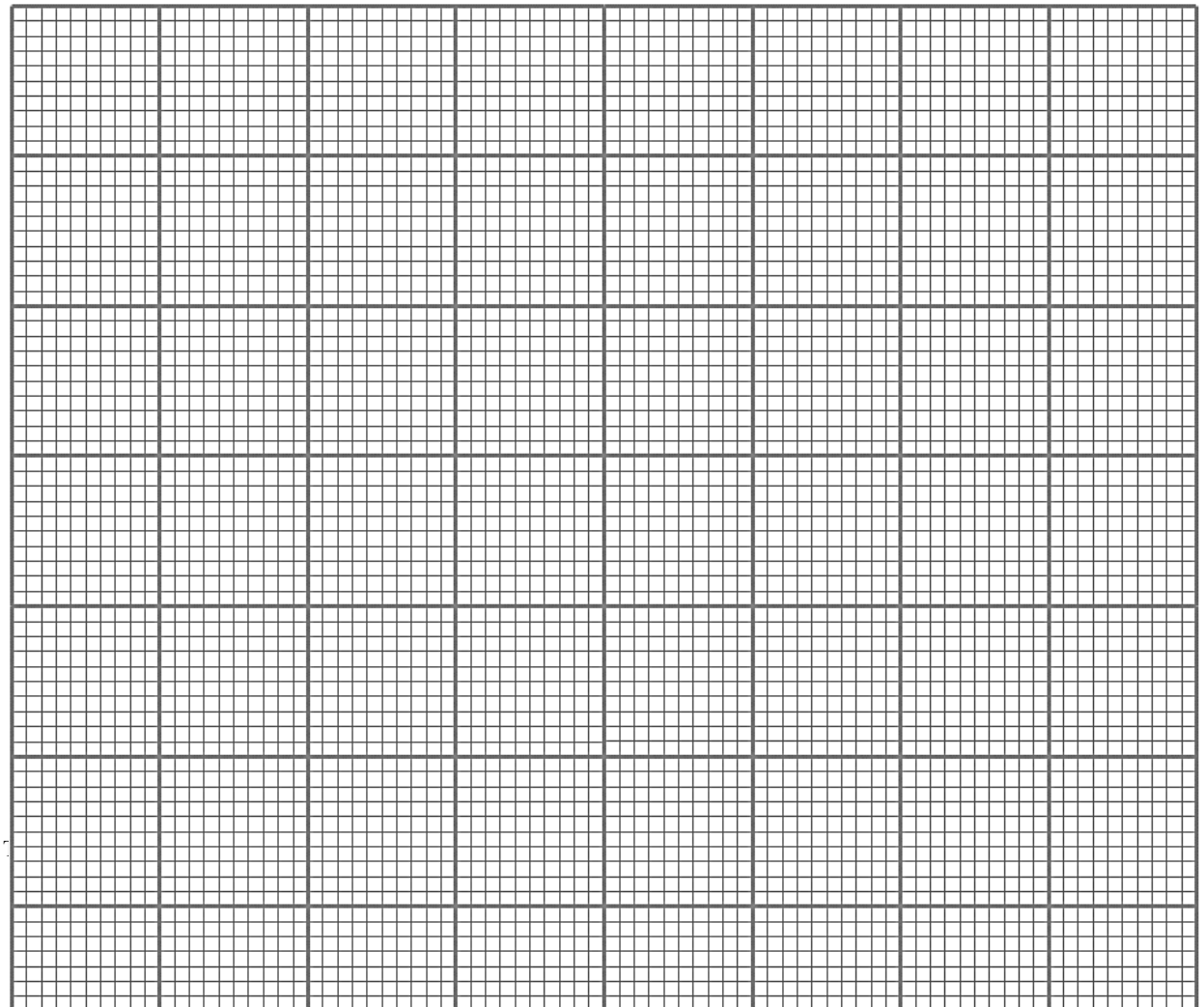
(a) Calculate the values of p and q.

Answer $p =$ ....,

$q =$ ..... [2]

(b) Using a scale of 2 cm to represent 1 unit on the x-axis and 2 cm to represent 10 units on the y-axis,

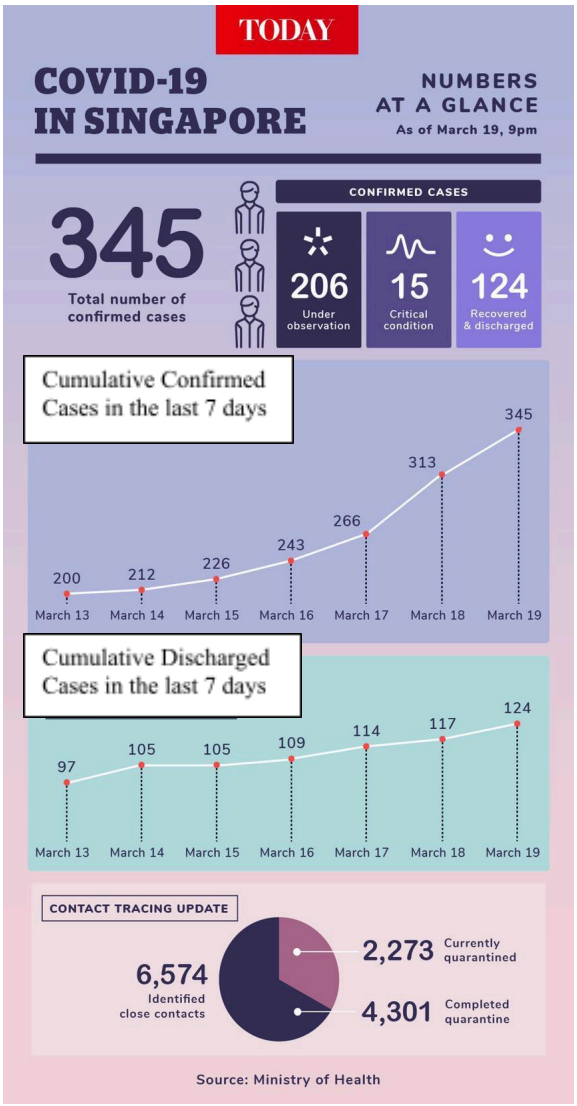
draw the graph of $y = 25 + 4x - 3x^2$ for $-3 \le x \le 3$ on the grid below. [3]

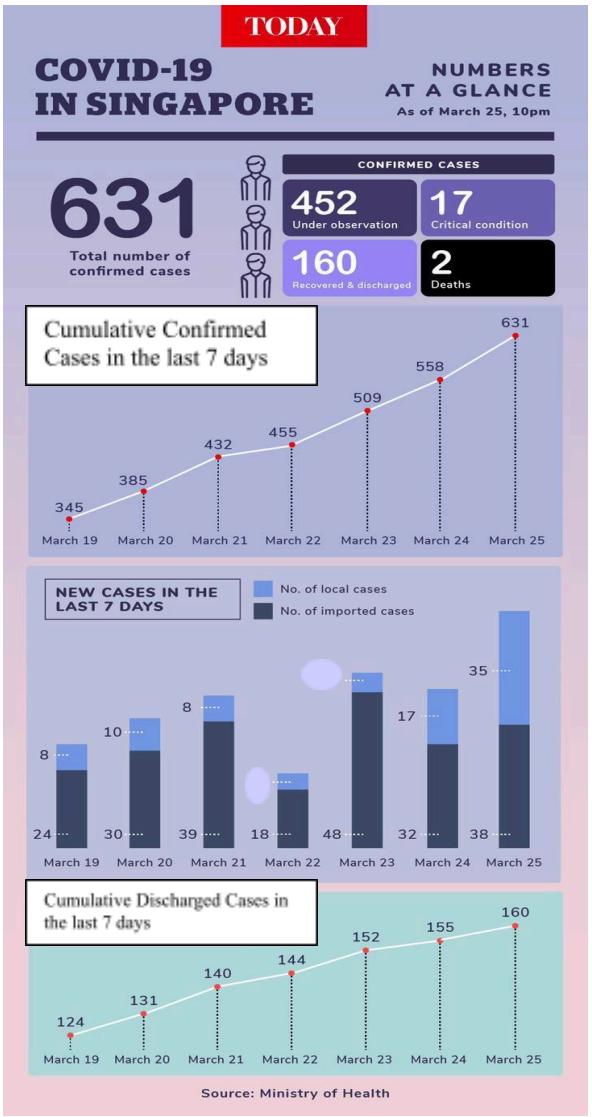


(c) Using your graph, write down the maximum value of y.

Answer $y =$ ..... [1]

11 Infographics published by TODAY newspaper on the spread of the coronavirus are shown below.





(a) Using the infographic above, find the values of the unknowns in the table below.

Date	Number of new cases
13th March	Cannot tell from infographic
14th March	12
15th March	x
16th March	17
17th March	23
18th March	y
19th March	32

Answer $x =$ ……

$y =$ …….. [2]

(b) From 13th March to 25th March, which day was the increase in new cases the greatest?

Answer …… [1]

(c) On 17th March, how many infected patients were there?

Answer …… [1]

(d) Calculate the percentage increase in the number of infected patients from 19th March to 25th March 2020.

Answer …… [2]

(e) Calculate the mean number of new cases from 14th March to 25th March.

Answer …… [2]

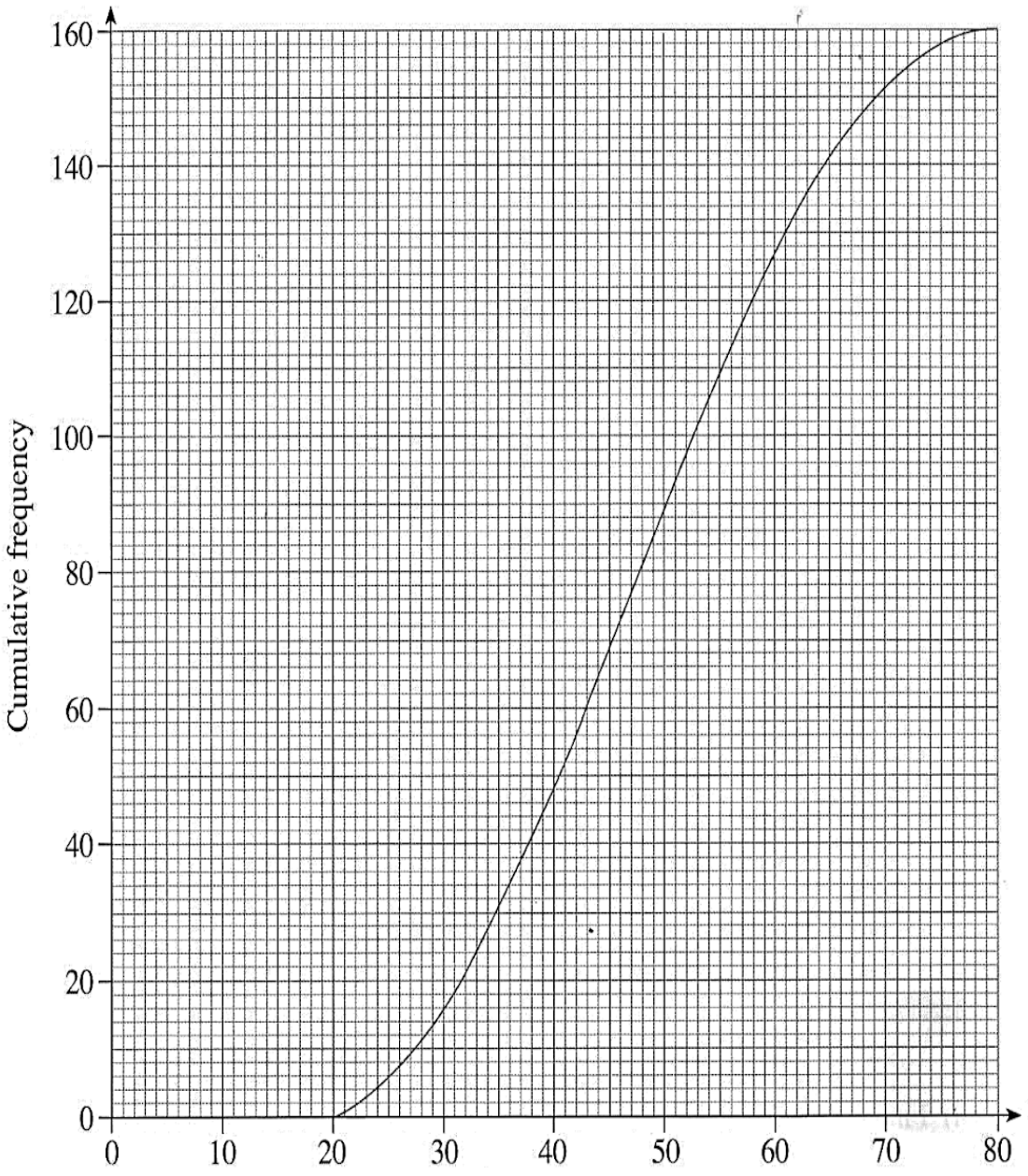
---------- End of Section A----------

Section B (8 marks)

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

12 **(a)** The ages of 160 members of the Zoo loyalty program were recorded.

The data is summarised in the cumulative curve below.



Age of Members (years)

(i) How many members were above 60 years old?

Answer ..... [1]

(ii) In a lucky draw, a member is chosen at random to win the grand prize.
Find the probability that the member is above 60 years old.

Answer ..... [1]

(iii) Estimate the interquartile range.

Answer ..... [2]

(b) The weights, w, of 34 students from class 4G are recorded.
The results are shown in the table below.

Weight	$30 < w \leq 40$	$40 < w \leq 50$	$50 < w \leq 60$	$60 < w \leq 70$
No of students	2	11	16	5

(i) Calculate an estimate of the mean and standard deviation of the weights of the students from class 4G.

Answer Mean:……

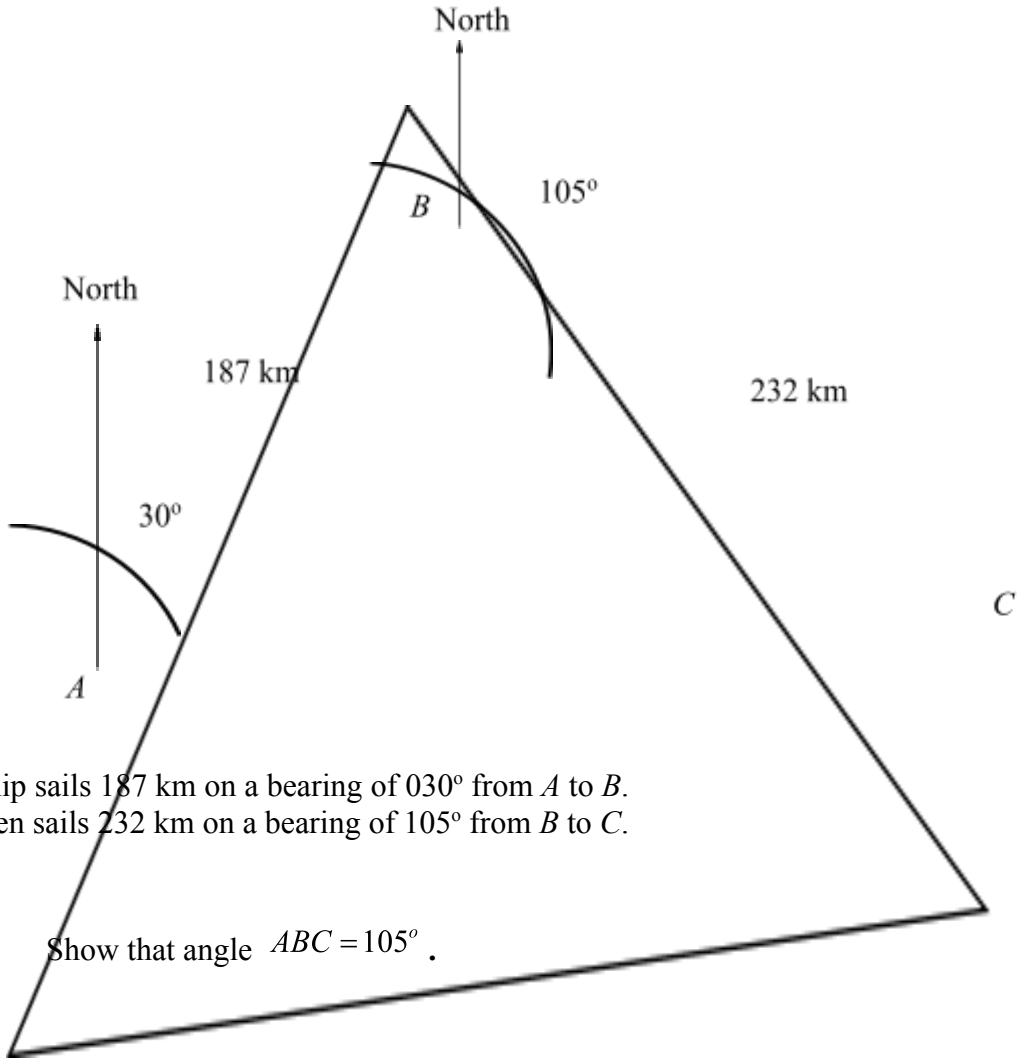
Standard deviation: …….[3]

(ii) The weights of students in class 4H were also recorded.
The mean weight was 53.1 and the standard deviation is 7.5.

Compare the spread of the weights of the students from both classes.

[1]

13



A ship sails 187 km on a bearing of 030° from A to B.
It then sails 232 km on a bearing of 105° from B to C.

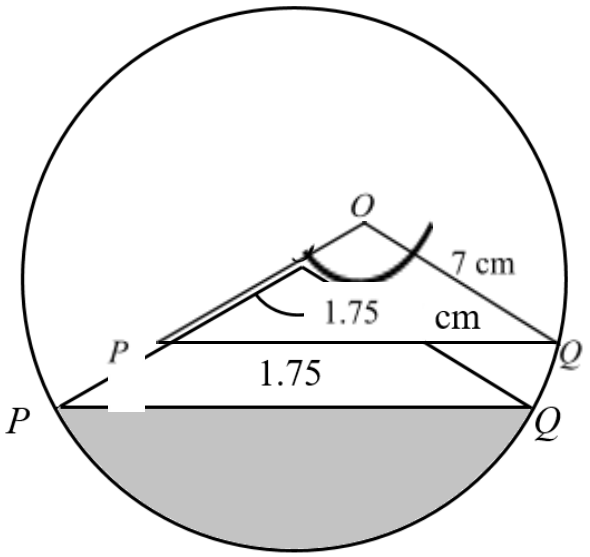
(a) Show that angle $ABC = 105^o$.

[2]

(b) Calculate the distance of AC.

Answer ……km [3]

(c) In the diagram below, P and Q lie on the circle with centre O, of radius 7 cm. and $\angle POQ = 1.75$ radians .



Find the area of the shaded part.

Answer ……cm^2 [3]

END OF PAPER

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