Name:	Class: Sec _____	Index No.: _____

4E/5NA

MERIDIAN SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2020

MATHEMATICS **Paper 1**

4048/01 31 August 2020

SECONDARY 4 EXPRESS / 5 NORMAL (ACADEMIC) **2 hours**

Candidates answer on the Question Paper.

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 on both sides of the paper.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions.
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 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, unless the question requires the answer in terms of π.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is **80**.

Marks deducted for	
3 s.f. / 1 d.p.	
Inaccuracy	
Missing Geometrical Reason	
Total Deducted (Maximum 2)	

For Examiner's Use	
Score	

This question paper consists of **22** printed pages, including this page.

Setter: Mr Geoffrey Cheang **[Turn over**

Mathematical Formulae

Compound Interest

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

Mensuration

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

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

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

Answer **all** the questions.

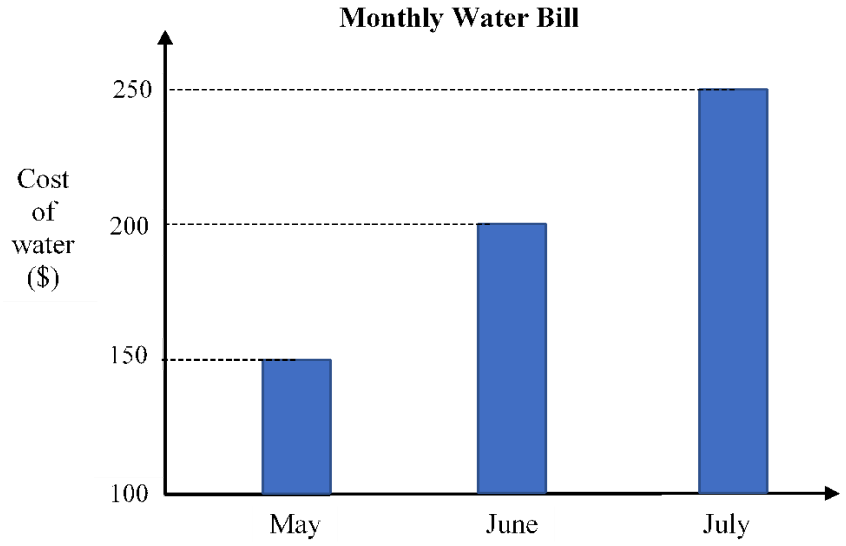
1 Calculate $\frac{11.27^{\frac{1}{4}}}{30.67-(5.23)^2}$.

Write your answer correct to 4 significant figures.

Answer ..... [1]

---

2 Kiegen draws this graph to show his monthly water bill for each of the last three months.



State one aspect of the graph that may be misleading and explain how this may lead to a misinterpretation of the graph.

.....

.....

.....

[1]

---

3 Given that $7^{2x+1} \times \frac{1}{49} = 1$, find x.

Answer $x =$ ..... [2]

---

4 **(a)** Express 3024 as a product of its prime factors.

Answer ..... [1]

(b) Hence, find the smallest positive integer m such that $\frac{3024}{m}$ is a cube number.

Answer ..... [1]

---

5 Employees of a company are offered a salary increase based on one of the schemes:

Scheme A: An increase of 12% of their present salary.

Scheme B: An increase of \$90 plus 10% of their present salary.

Gwendolyn finds that both schemes will give her the same salary increase. Given that Gwendolyn's present salary is \$$x$, form an equation in terms of x and hence find her present salary.

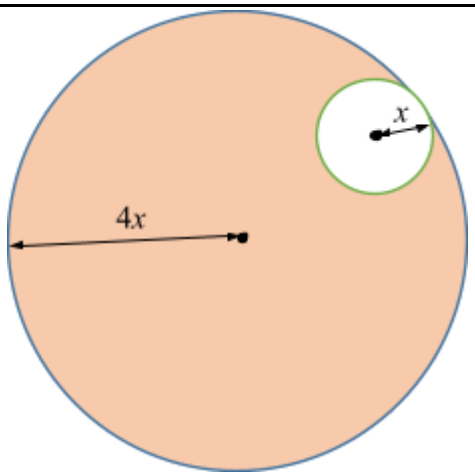
Answer \$ **……..…….** [2]

---

6 Express $\frac{x}{2x-1} - \frac{3}{x+1}$ as a single fraction in its simplest form.

Answer **……** [2]

7



The diagram shows two circles with radii x and $4x$.

A point is chosen, at random, inside the larger circle.

Find, in its simplest fractional form, the probability that this point is in the shaded area.

Answer ..... [2]

8 x is directly proportional to y^2.

y is decreased by 40%.

Find the percentage decrease in x.

Answer ..... [2]

9 Solve the equation $2x^2 - 11x = 21$.

Answer x = ……..…… or ……..…... [3]

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10 **(a)** Solve the inequalities $-3 < \frac{1}{2}x - 5 \leq \frac{2}{3}$.

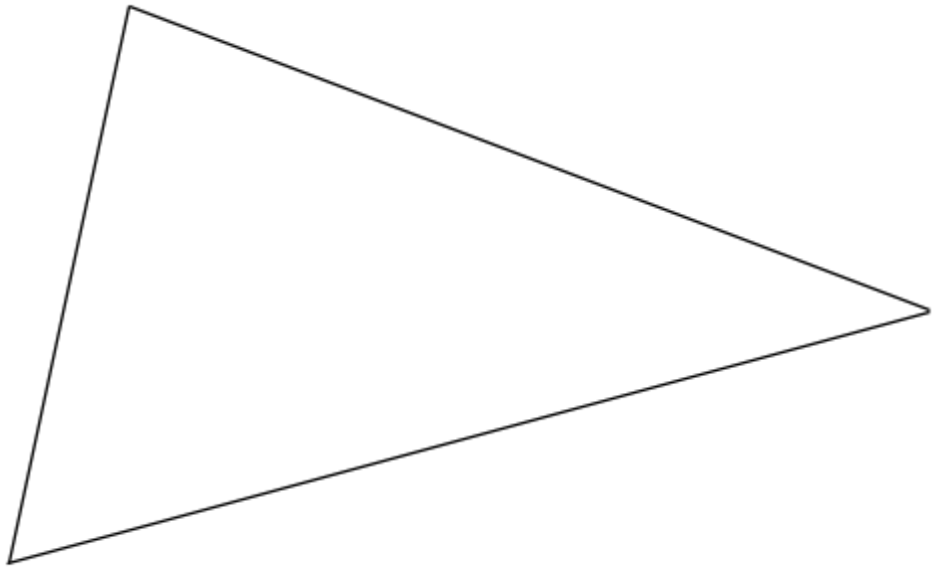
Answer …….. [2]

(b) Write down all the prime numbers which satisfy $-3 < \frac{1}{2}x - 5 \leq \frac{2}{3}$.

Answer …….. [1]

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11 The diagram shows a triangle ABC.



A
B

C

(a) On the diagram, construct

(i) the bisector of angle *ABC*,

[1]

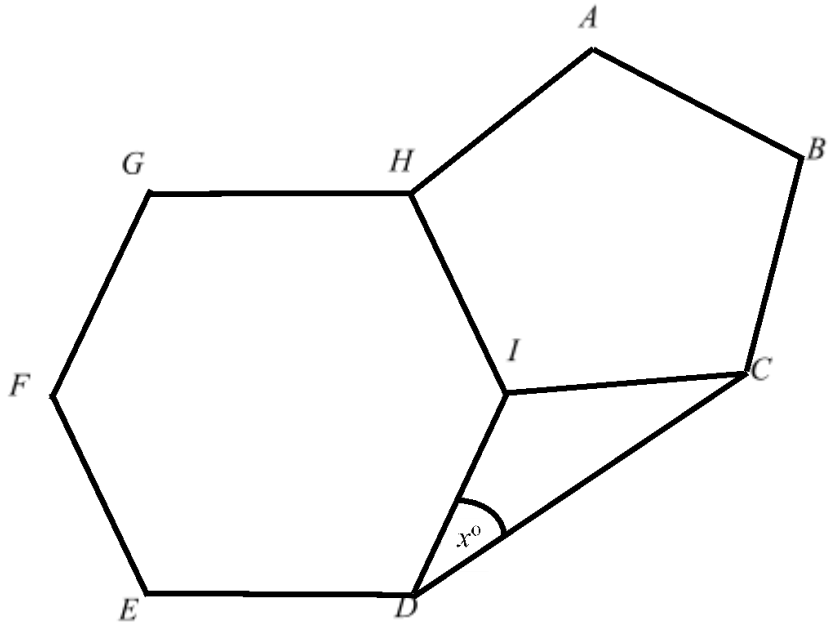
(ii) the perpendicular bisector of *BC*,

[1]

(b) Mark clearly a possible point which is inside the triangle, equidistant from *B* and *C*, and is nearer to *AB* than *BC*. Label this point *X*.

[1]

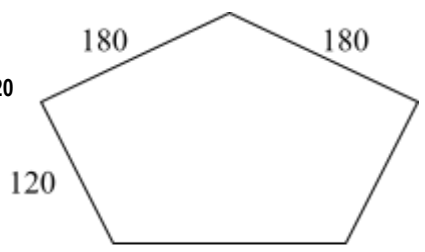
12 The diagram shows a regular pentagon *ABCIH*, a regular hexagon *DEFGHI* and a triangle *CDI*.



Find x.
Give a reason for each statement you make.

Answer x = ... [3]

13





The diagram shows a pond in the shape of a pentagon.
The measurements given are in metres and the diagram is not drawn to scale.

Lamp posts are to be constructed around the perimeter of the pond with the following requirements:

- The lamp posts are to be equally spaced from each other.
- One lamp post must be constructed at each vertex of the pentagon.
- Minimum number of lamp posts are to be constructed to save cost.

Find

(a) the distance between any two lamp posts.

Answer **……...…….**m [1]

(b) the number of lamp posts to be constructed.

Answer **……..…...…** lamp posts [2]

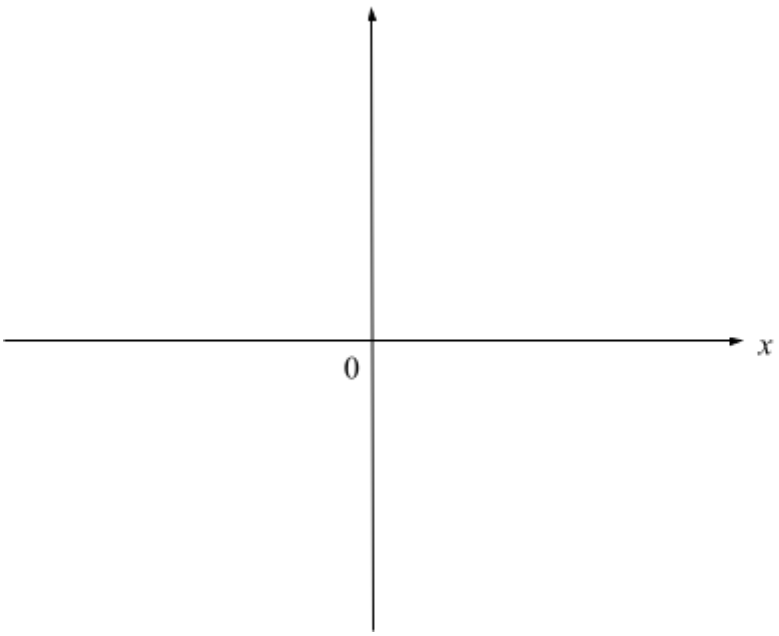
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14 The ratio of the breadth to the length of a rectangle is 1 : 2. If the breadth is reduced by 50% and the length is increased by 25%, calculate the new area as a percentage of the original area of the rectangle.

Answer ……..……..…% [3]

---

15 **(a)** Sketch the graph of $y=(x-3)(x+2)$ on the axis below.
Indicate clearly the coordinates of the points where the graph crosses the axes and the minimum point on the curve.



[2]

(b) Write down the equation of the line of symmetry of the graph.

Answer …….. [1]

---

16 The matrices below show the results of 14 games played by two floorball teams and the points awarded.

$$\begin{array}{r} \\ \text{Courage} \\ \text{Diligence} \end{array} \begin{array}{c} \begin{array}{ccc} \text{Won} & \text{Drawn} & \text{Lost} \end{array} \\ \begin{pmatrix} 7 & 4 & 3 \\ 6 & 5 & 3 \end{pmatrix} \end{array} \qquad \begin{array}{r} \text{Points} \\ \text{Won} \\ \text{Drawn} \\ \text{Lost} \end{array} \begin{pmatrix} 3 \\ 1 \\ 0 \end{pmatrix}$$

(a) Find $\begin{pmatrix} 7 & 4 & 3 \\ 6 & 5 & 3 \end{pmatrix}\begin{pmatrix} 3 \\ 1 \\ 0 \end{pmatrix}$.

Answer **……..** [2]

(b) Explain what your answer to **(a)** represents.

……...

……...

……..
[1]

---

17 **(a)** Factorise $5x^2 - 20y^2$ completely.

Answer **……..** [2]

(b) Factorise completely $6ap + 9aq - 6bq - 4bp$.

Answer **……..** [2]

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18 A map is drawn to a scale of 1 : 2 500 000.

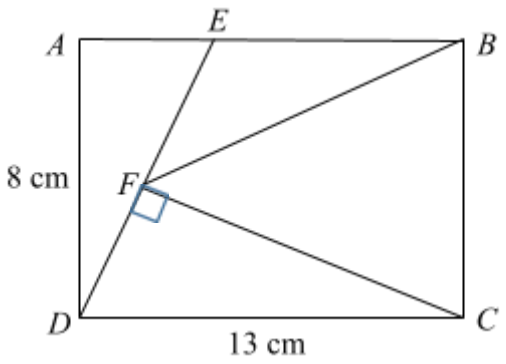
(a) The length of the longest highway on the map is 16.8 cm.
Find the actual distance, in kilometres, of this highway.

Answer ..... km [1]

(b) A country has an actual area of 102 020 km^2.
Find the area, in square centimetres, of that country on the map.

Answer .....cm^2 [2]

19



In the diagram, *ABCD* is a rectangle, *DFE* is a straight line and *E* lies on *AB*.
FC is perpendicular to *DE* at *F*.
DE = *DC* = 13 cm and *FC* = *AD* = 8 cm.

(a) Show that triangle *DAE* and triangle *CFD* are congruent.
Give a reason for each statement you make.

Answer

[2]

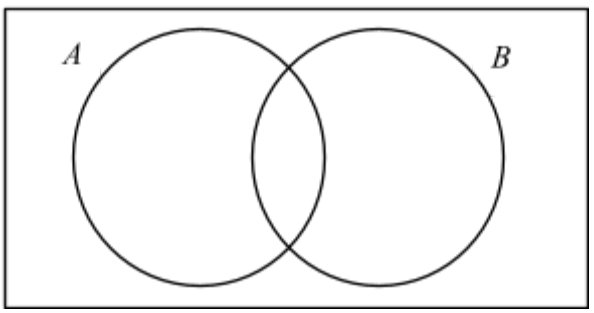
(b) Find the area of *BCFE*.

Answer .....cm^2 [2]

---

20 **(a)** On the Venn Diagram shown in the answer space, shade the set $(A \cap B')'$.

Answer



[1]

(b) ξ = {students in a school}
A = {male students}
B = {students who wear spectacles}
C = {students who walk to school}

Express male students who do not wear spectacles and walk to school in set notation.

Answer ..... [1]

(c) ξ = {x : x is an integer and $12 < x \leq 21$ }
P = {x : x is a prime number}
Q = {x : x is divisible by 7}

Find

(i) $P \cup Q$,

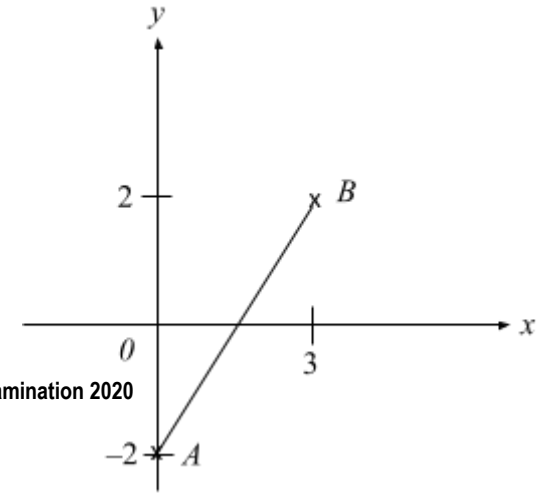
Answer ..... [1]

(ii) P' .

Answer ..... [1]

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21 Point A has coordinates (0, −2). Point B has coordinates (3, 2).



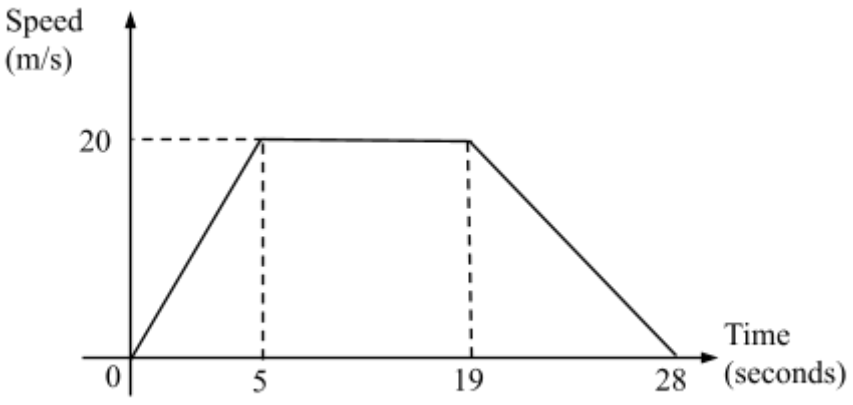
(a) Find the equation of the line AB.

Answer …….. [2]

(b) Calculate the length of the line segment AB.

Answer ……units [2]

22



The speed-time graph shows the journey of a car.

(a) How long was the car travelling at zero acceleration?

Answer ..... s [1]

(b) Find the speed of the car at 4 seconds.

Answer ..... m/s [2]

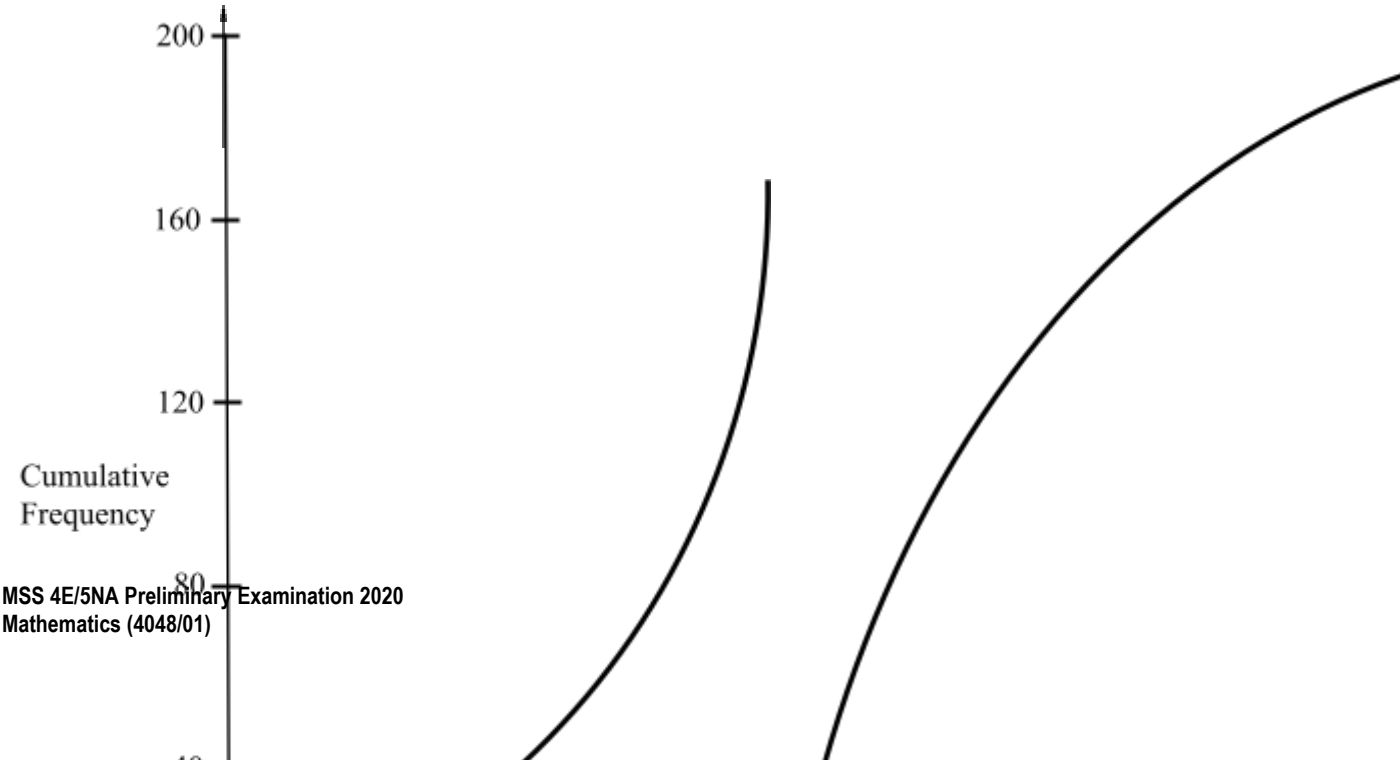
(c) The speed limit of the road at which the car was travelling was **70 km/h**.
Show, with working, whether the car exceeded the speed limit.

Answer

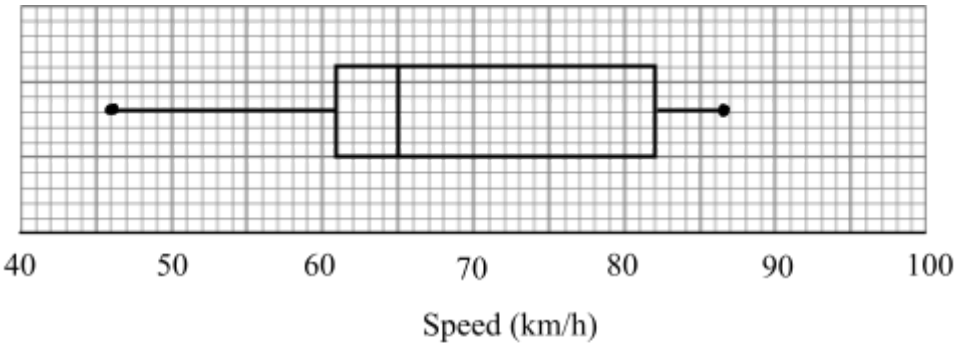
[2]

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23 The cumulative frequency graph shows the distribution of the speed of 200 cars on a particular morning.



This box-and-whisker plot represents the distribution of the speed of another 200 cars on the same day in the evening.



(a) Use the two diagrams to complete this table for the speed of cars in the morning and evening.

Time	Lower Quartile	Median	Upper Quartile	Interquartile Range
Morning	70.5			
Evening		65	82	21

[2]

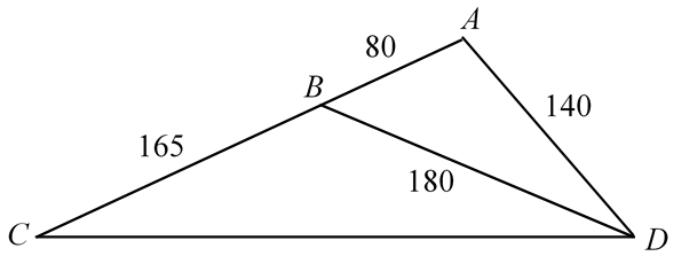
(b) The speed limit on this road is 80 km/h.
Below are two statements comparing the speeds in the morning and evening.
For each one, write whether you agree or disagree, giving a reason for your answer.

Statement 1: The cars are traveling at a more consistent speed in the evening than in the morning.

Agree/Disagree:
Reason:
Statement 2: There is a higher chance that a car can be issued with a fine for speeding in the morning than in the evening.
Agree/Disagree:
Reason:

[3]

24 ABD is a triangle where AB = 80 cm, AD = 140 cm, and BD = 180 cm.
AB is produced to C and BC = 165 cm.



(a) Show that triangle ACD is similar to triangle ADB.
Answer

[2]

(b) Calculate the length CD.

Answer .....cm [1]

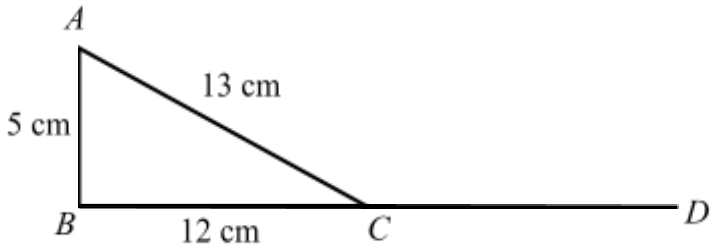
(c) Calculate angle BAD.

Answer ..... [3]

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25 **(a)** ABC is a triangle and B, C and D forms a straight line.

AB = 5 cm, BC = 12 cm and AC = 13 cm.



(i) Show that ABC is a right-angled triangle.

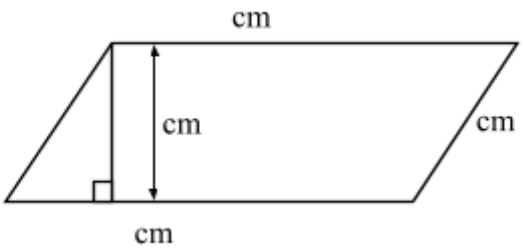
Answer

[2]

(ii) Find $\sin \angle ACD$.

Answer ..... [1]

(b)



The diagram shows a parallelogram.

(i) Form two different equations involving x and y.

Answer …….. [1]

…….. [1]

(ii) Find the values of x and y by solving the equations in **(b)(i)** simultaneously.

Answer x =…….. [1]

y =…….. [1]

END OF PAPER 1