Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate Examination

Mathematics
(Project Maths – Phase 1)

Paper 2

Ordinary Level

Monday 13 June   Morning 9:30 – 11:30

300 marks

Examination number

Centre stamp

Running total	

For examiner			
Question	Mark	Question	Mark
1		11	
2		12	
3		13	
4		14	
5		15	
6		16	
7		17	
8			
9			
10		Total	

Grade

Instructions

There are seventeen questions on this examination paper.

Answer **all** questions.

Questions do not necessarily carry equal marks. To help you manage your time during this examination, a maximum time for each question is suggested. If you remain within these times, you should have about 10 minutes left to review your work.

Write your answers in the spaces provided in this booklet. There is space for extra work at the back of the booklet. You may also ask the superintendent for more paper. Label any extra work clearly with the question number and part.

The superintendent will give you a copy of the booklet of *Formulae and Tables*. You must return it at the end of the examination. You are not allowed to bring your own copy into the examination.

Marks will be lost if all necessary work is not clearly shown.

Answers should include the appropriate units of measurement, where relevant.

Answers should be given in simplest form, where relevant.

Write the make and model of your calculator(s) here:

Question 1   **(Suggested maximum time: 2 minutes)**

Multiply 320 grams by 5 and give your answer in kilograms.
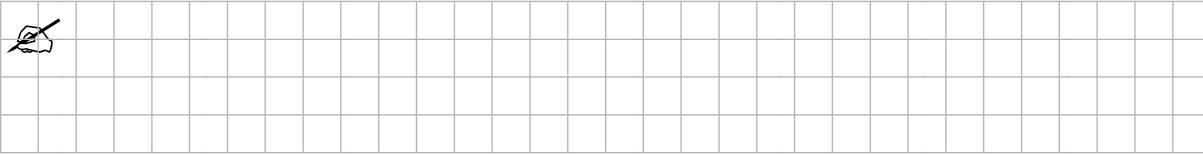
Question 2   **(Suggested maximum time: 10 minutes)**

John travelled by car from Tralee to Galway. He left Tralee at 09:45 and arrived in Galway at 12:57.
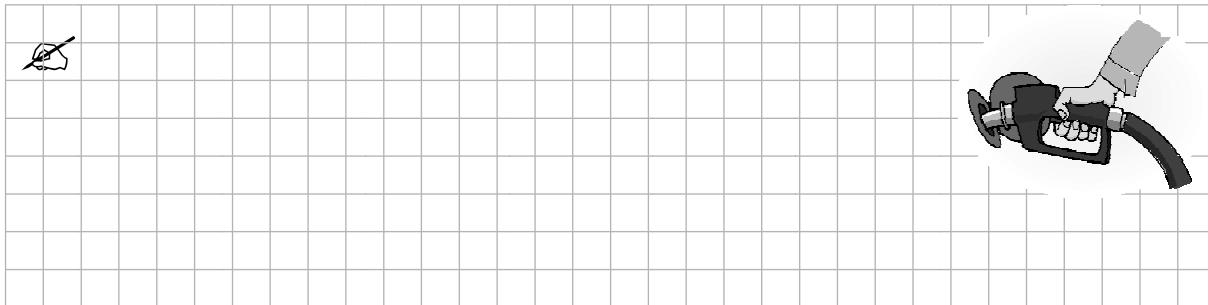
(a) How long did it take John to travel from Tralee to Galway? Give your answer in hours and minutes.

(b) The distance from Tralee to Galway is 200 km. Calculate John's average speed, in km/h.

(c) John had estimated it cost 22 cent per km to drive his car. How much did it cost him to drive his car from Tralee to Galway?
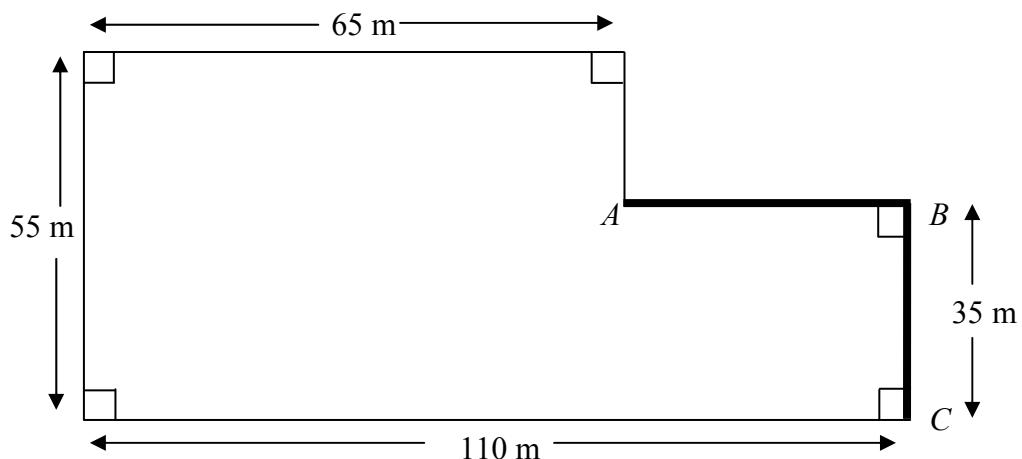
Question 3   **(Suggested maximum time: 5 minutes)**

The shape and measurements of a field are shown in the diagram below.

(a) Find the length $|AB|$.

(b) Find the length of the perimeter of the field.

(c) The sections $[AB]$ and $[BC]$ are stone walls. A farmer wishes to put fencing around the rest of the field. The fencing costs €62·50 per 5 metres. Find the cost of the fencing.

Question 4   **(Suggested maximum time: 10 minutes)**

The average weekly earnings for people working for manufacturing industries in Ireland from 1998 to 2006 are given in the table below. The earnings are given to the nearest euro.

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006
Male	429	453	478	512	538	565	589	610	624
Female	285	298	325	347	365	394	407	430	451
All Persons	375	397	423	457	483	512	534	558	575

Source: Central Statistics Office

(a) Find the difference between the average male earnings and the average female earnings in each of the years 1998 and 2006.

1998
Male   =
Female   = _____
Difference =

2006
Male   =
Female   = _____
Difference =

(b) Write the average female earnings as a percentage of the average male earnings for each of the years 1998 and 2006. Give your answers correct to two significant figures.

1998   2006

$$\frac{\text{Female earnings}}{\text{Male earnings}} \times \frac{100}{1} =$$

(c) From your answers to **(a)** and **(b)** above, would you say that these average wages have become more equal or less equal over these nine years? Give a reason for your answer.

Answer:

Reason:

(d) The average weekly earnings for "All Persons" in 1998 is €375. This is not the average of €429 and €285. Explain why this might be the case.

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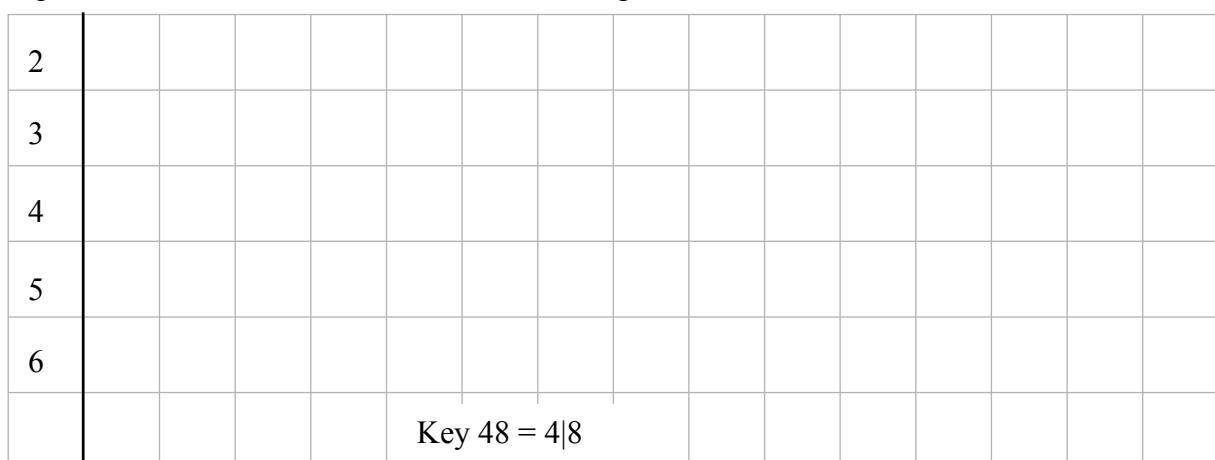
Question 5 (Suggested maximum time: 10 minutes)

Tom's third year Physical Education class did a fitness test. The number of sit-ups that each student did in one minute is recorded below:

59	48	27	53	36	29	52	46	45	37	49	51
33	45	38	52	40	51	37	44	47	45	60	41

(a) Represent the data above on a stem-and-leaf diagram.

| 2	
3	
4	
5	
6	

Key 48 = 4|8

(b) How many students are in the class? _____

(c) What is the range of sit-ups for the class? _____

(d) What is the mode of the data? _____

(e) Find the mean of the data correct to one decimal place.

(f) Tom did 48 sit-ups in the test. How does this compare to the rest of the class?

Question 6

Mary has a bag of marbles. The number of marbles of each colour is shown in the box.

Contents.
7 yellow marbles
3 green marbles
4 red marbles
2 black marbles

(a) How many marbles are in the bag? _____

Mary takes a marble from the bag at random.

(b) Complete the sentence below.
The probability that Mary will take a _____ marble from the bag is $\frac{1}{4}$.

(c) "The probability of taking a red marble is greater that the probability of taking a yellow marble." Is this statement correct? Give a reason for your answer.

Answer:

Reason:

Mary found five more black marbles and added them to the bag.

Contents.
___ yellow marbles
___ green marbles
___ red marbles
___ black marbles

(d) Fill in the number of marbles of each colour in the bag after she has done this.

(e) Mary takes a marble from the bag at random. What is the probability that she will take a black marble from the bag?

Question 7   **(Suggested maximum time: 5 minutes)**

(a)   Let $A = \{1, 2, 3, 4, \ldots, 25\}$. Write out all the elements of A that are divisible by 2 but not divisible by 3.

(b)   What is the probability that a number chosen at random from the set A is divisible by 2 but not divisible by 3?

Question 8   **(Suggested maximum time: 5 minutes)**

Una rolls a die and flips a coin. One of the possible outcomes is (1, Head).

(a)   Write out the remaining eleven possible outcomes in the table below.

(1, Head)	

(b)   How many outcomes consist of an odd number and a Tail? _____

(c)   What is the probability that the outcome will contain a prime number?
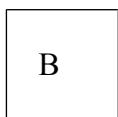
Question 9   **(Suggested maximum time: 5 minutes)**
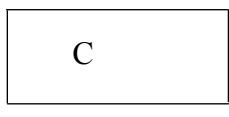
Four shapes are shown.
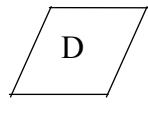
A	B	C	D
Parallelogram	Square	Rectangle	Rhombus

Tick (✓) below to show the shapes for which the statements are always true.

	A	B	C	D
The diagonals bisect each other				
Opposite sides are equal in length				
All sides are equal in length				
The diagonals are equal in length				
Opposite sides are parallel				

Question 10   **(Suggested maximum time: 5 minutes)**

The size of an A4 page is 210 mm $\times$ 297 mm.

(a) Describe how you would calculate the length of the longest line that could be drawn on an A4 page.
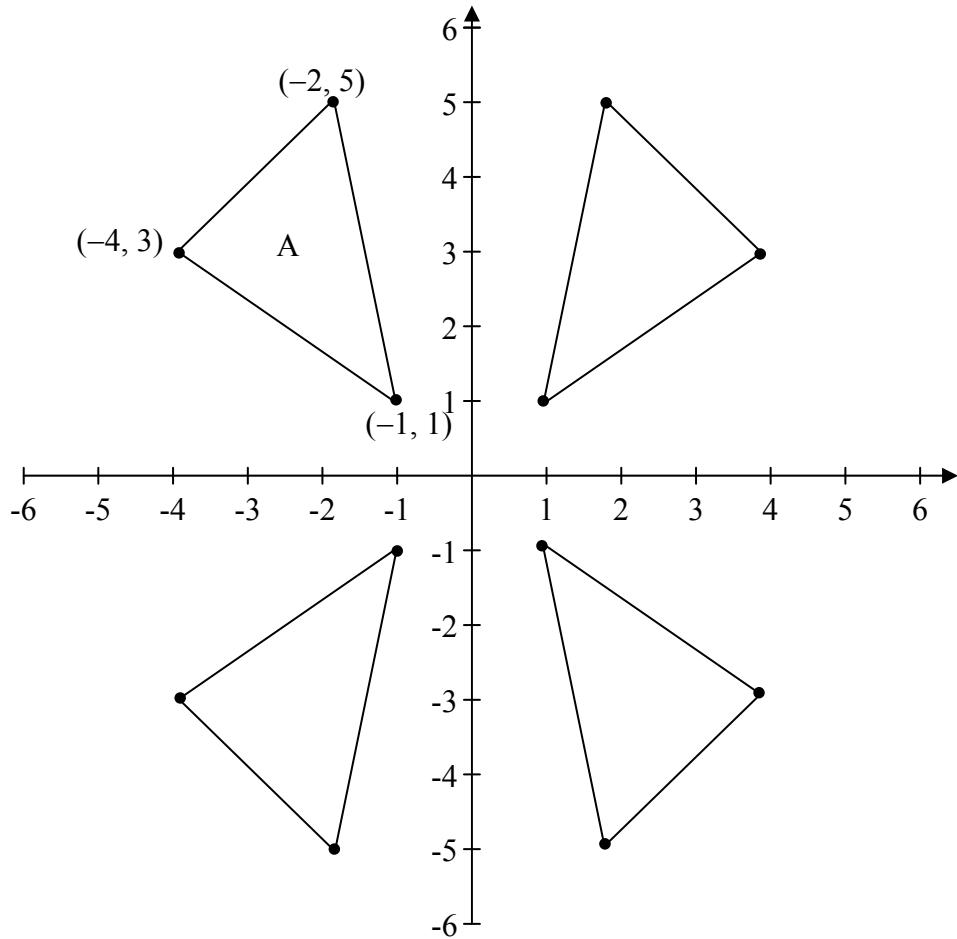
(b) Calculate the length of this longest line, correct to the nearest mm.

Question 11

The diagram below shows a triangle A on the coordinate plane and its image under a number of transformations.
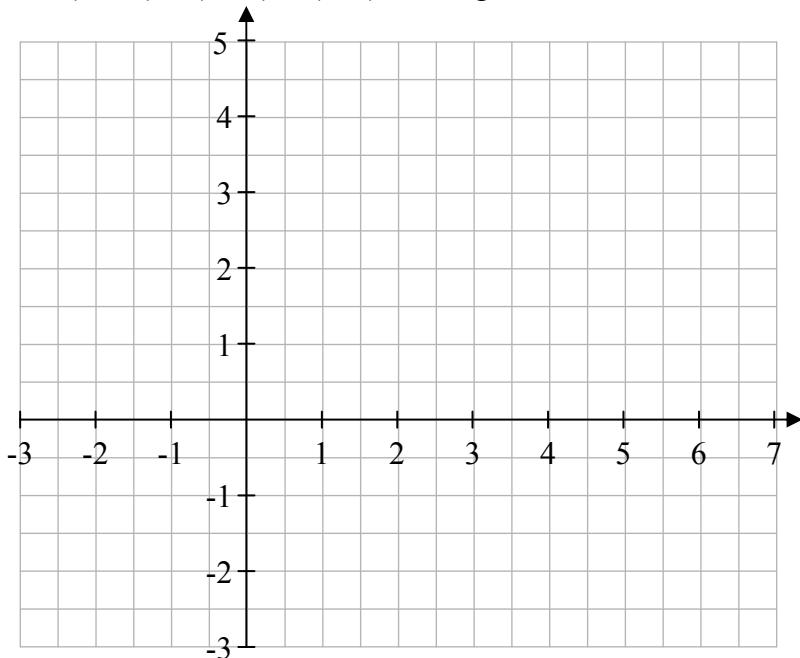
Write down the coordinates of the images of the vertices of A under each of the transformations listed below.

Transformation	Coordinates of vertices
Axial symmetry in the *y*-axis	(,), (,), (,)
Central symmetry in the point (0, 0)	
Axial symmetry in the *x*-axis	

Question 12 (Suggested maximum time: 5 minutes)
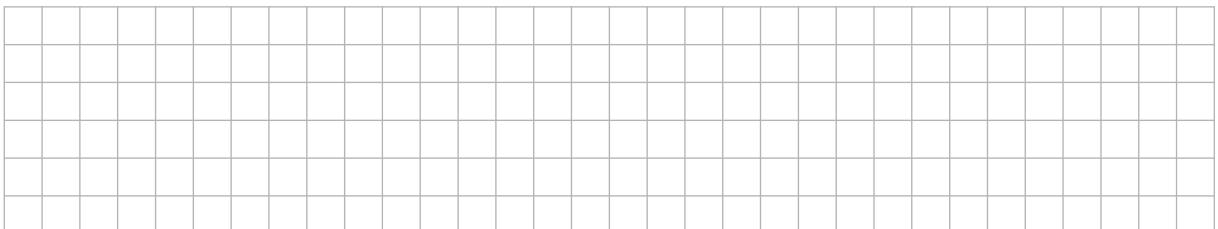
(a) Plot the points $A(-2, -2)$, $B(6, -2)$, $C(7, 3)$ on the grid below.
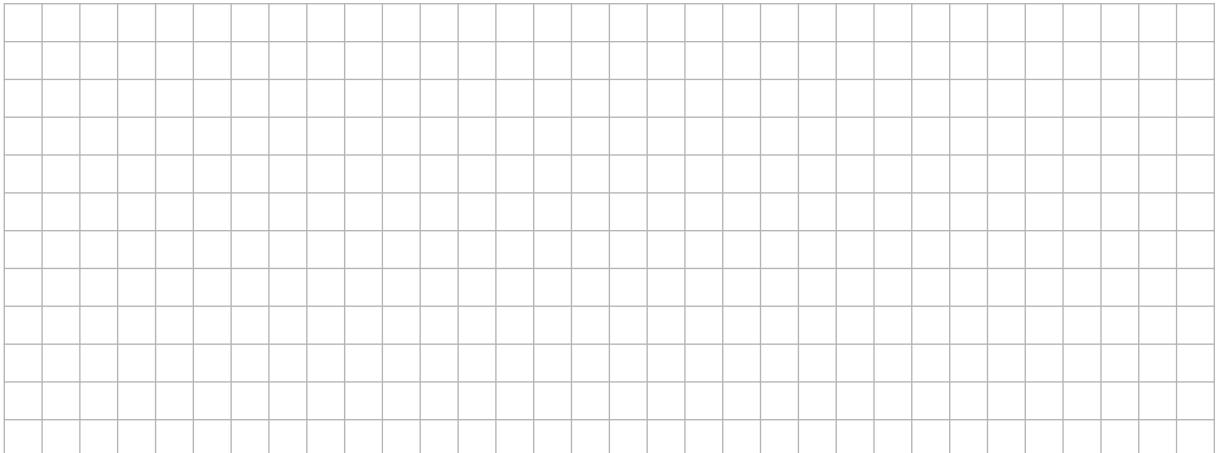
(b) Construct the point D such that $ABCD$ is a parallelogram and write down its coordinates.

$D = ($, $)$

(c) In Question 9 on page 9 you identified some properties of a parallelogram. Write down one of these.

(d) Using co-ordinate geometry formulae, verify that $ABCD$ has the property you wrote down in **(c)** above.

page	running
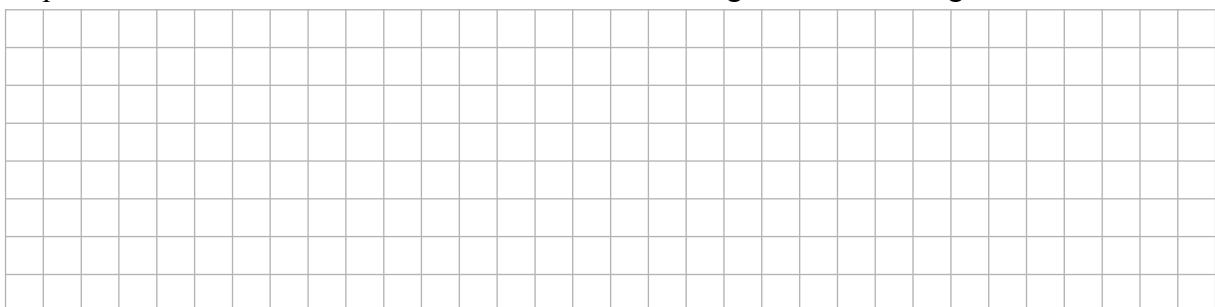
Question 13   **(Suggested maximum time: 5 minutes)**

Vera is standing on level ground beside a building on a sunny day. She is 1·6 m tall. Her shadow is 0·5 m in length. The building casts a shadow which is 6·2 m long.
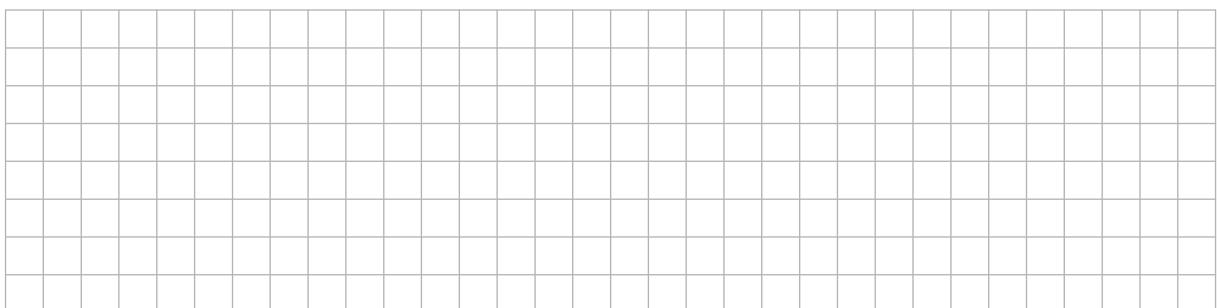
(a) Draw two triangles to show this.

| Vera	Building
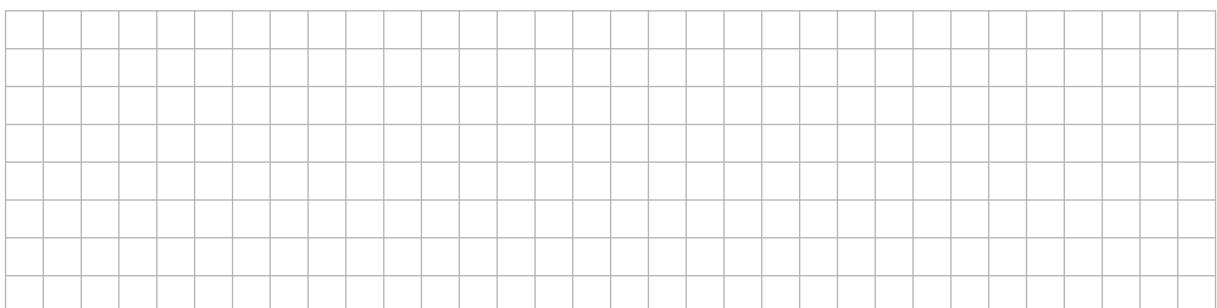
(b) Explain how this information can be used to find the height of the building.

(c) Find the height of the building.

(d) Find the angle of elevation of the sun, correct to the nearest degree.
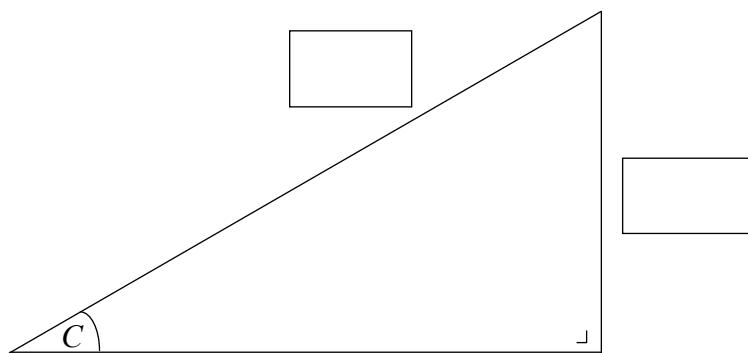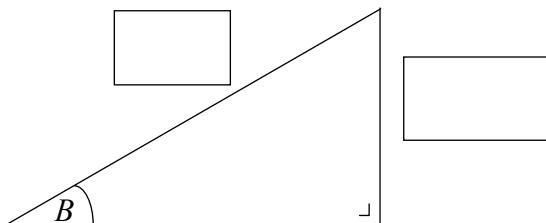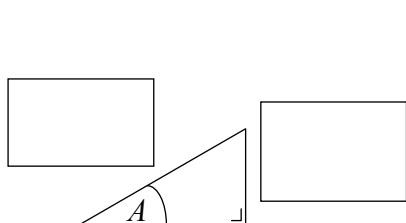
Question 14   **(Suggested maximum time: 10 minutes)**

(a)   What name is given to the longest side in a right-angled triangle? _____

(b)   In the case of each of the three right-angled triangles below, measure the two sides indicated and write the lengths in the boxes provided.

(c)   Use your measurements to write $\sin A$, $\sin B$ and $\sin C$ as fractions and also as decimals.

Fraction   Fraction

Decimal   Decimal

$\sin A = \dfrac{}{} = $ $\sin B = \dfrac{}{} = $

Fraction

Decimal

$\sin C = \dfrac{}{} = $
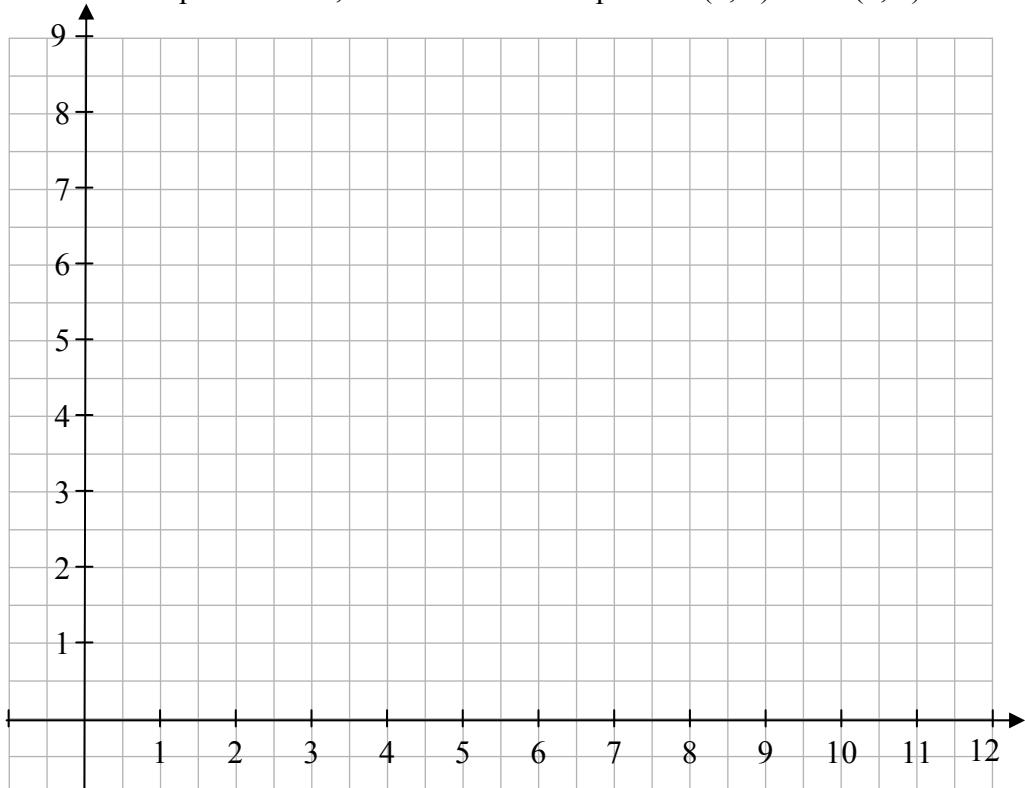
(d)   From the above information what can you say about the angles *A, B* and *C*? Give a reason for your answer.

page   running

Question 15   **(Suggested maximum time: 10 minutes)**

(a) On the co-ordinate plane below, mark and label the points $A(2, 9)$ and $B(6, 1)$.

(b) Using only a compass and straight-edge, construct the perpendicular bisector of the line segment $[AB]$. Show all construction lines clearly.

(c) C is the point $(10, 8)$. Find $|AC|$ and $|BC|$.

$|AC| =$ $|BC| =$

(d) What can you conclude about the triangle ABC? Give a reason for your answer.
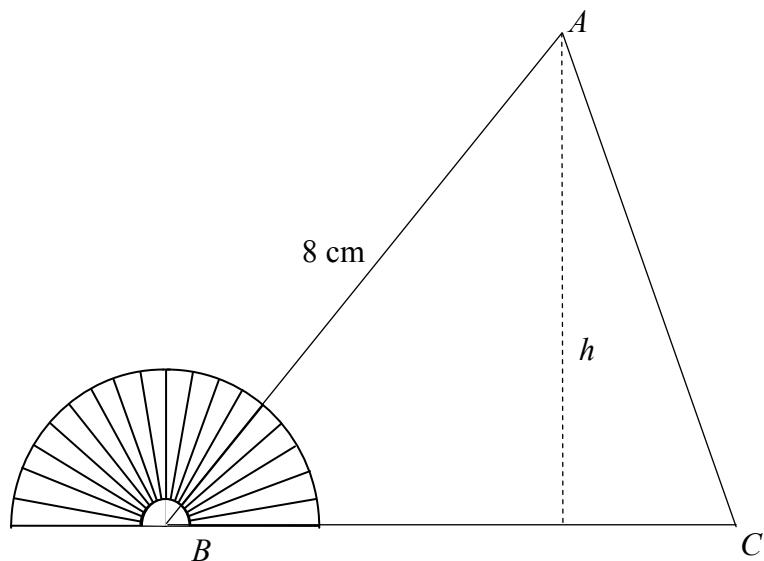
(e) D is the point where the perpendicular bisector of $[AB]$ crosses $[AB]$. Explain why the triangles DAC and DBC are congruent.

Question 16 **(Suggested maximum time: 5 minutes)**

A group of students want to find the vertical height (h) of the triangle *ABC*. Mary suggests measuring the angle at *B* using a protractor and using the sine function to find *h*.

(a) Estimate $|\angle B|$ from the diagram and hence find $\sin B$.

$|\angle B|$ = _____ $\sin B$ = _____
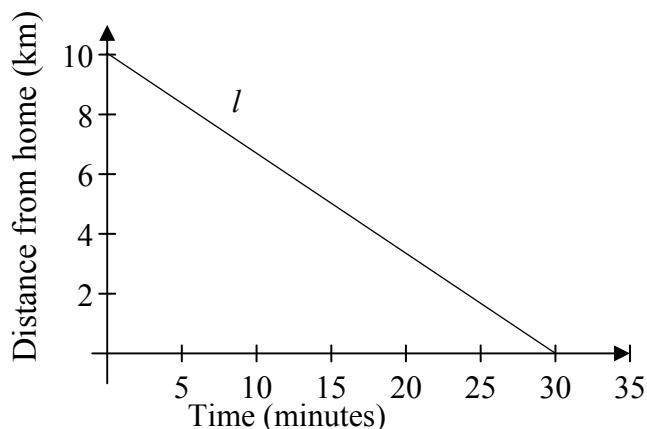
(b) If $|AB|$ = 8 cm, use your value of $\sin B$ to find *h*. Give your answer correct to the nearest whole number.

(c) If $|BC|$ = 7·5 cm use your answer from part **(b)** to find the area of *ABC*.

Question 17 (Suggested maximum time: 10 minutes)

John cycles home from school each day at a steady speed. The graph shows his distance from home, plotted against time, on a particular day. The graph is a straight line *l*.

(a) How long did it take John to cycle home from school on that day?

(b) How far from the school does he live?
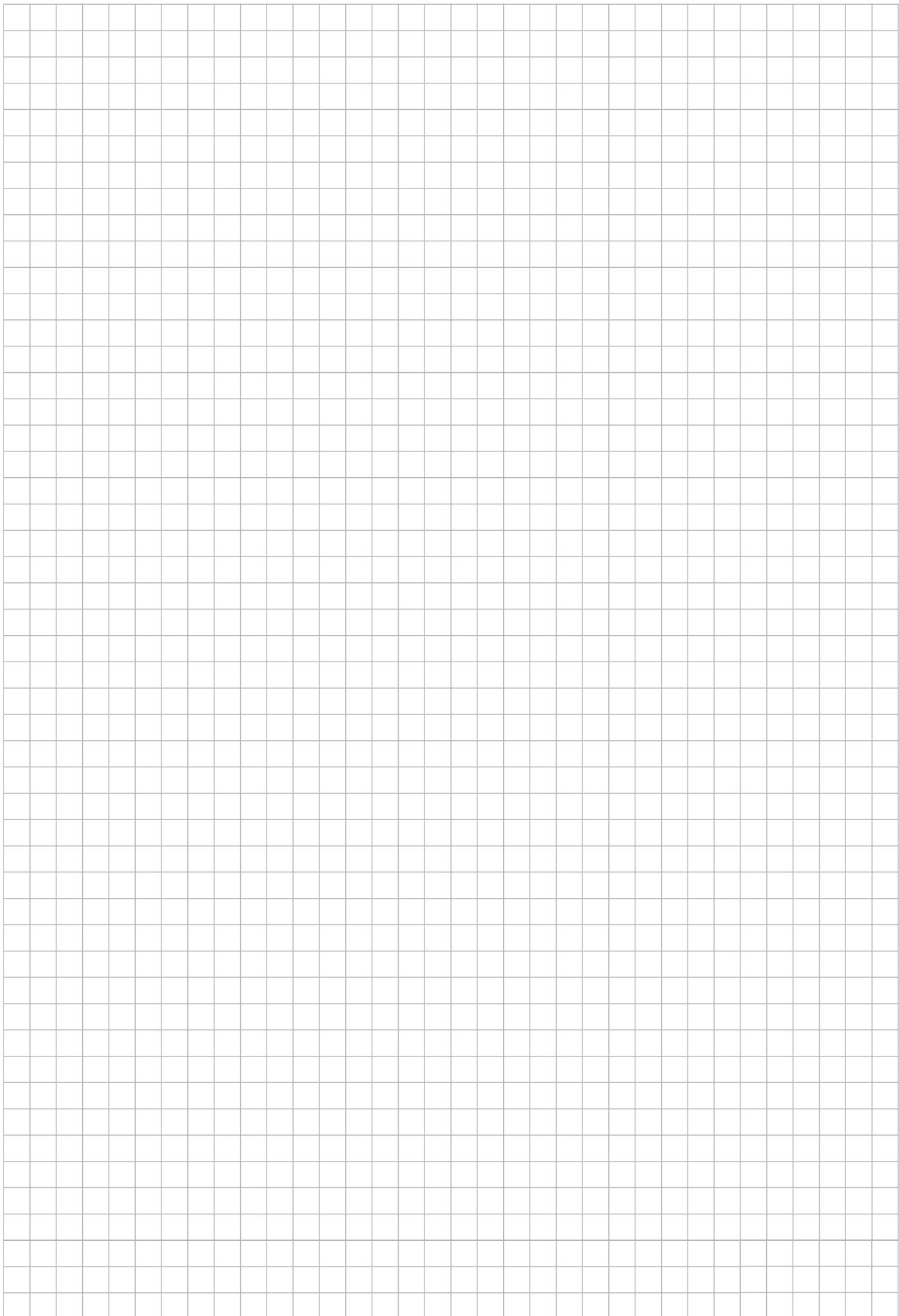
(c) The point (18, 4) is on the line *l*. Explain what this point represents in the context of this journey.

(d) Find the slope of *l*.

(e) Explain what the slope of *l* represents in the context of this journey.
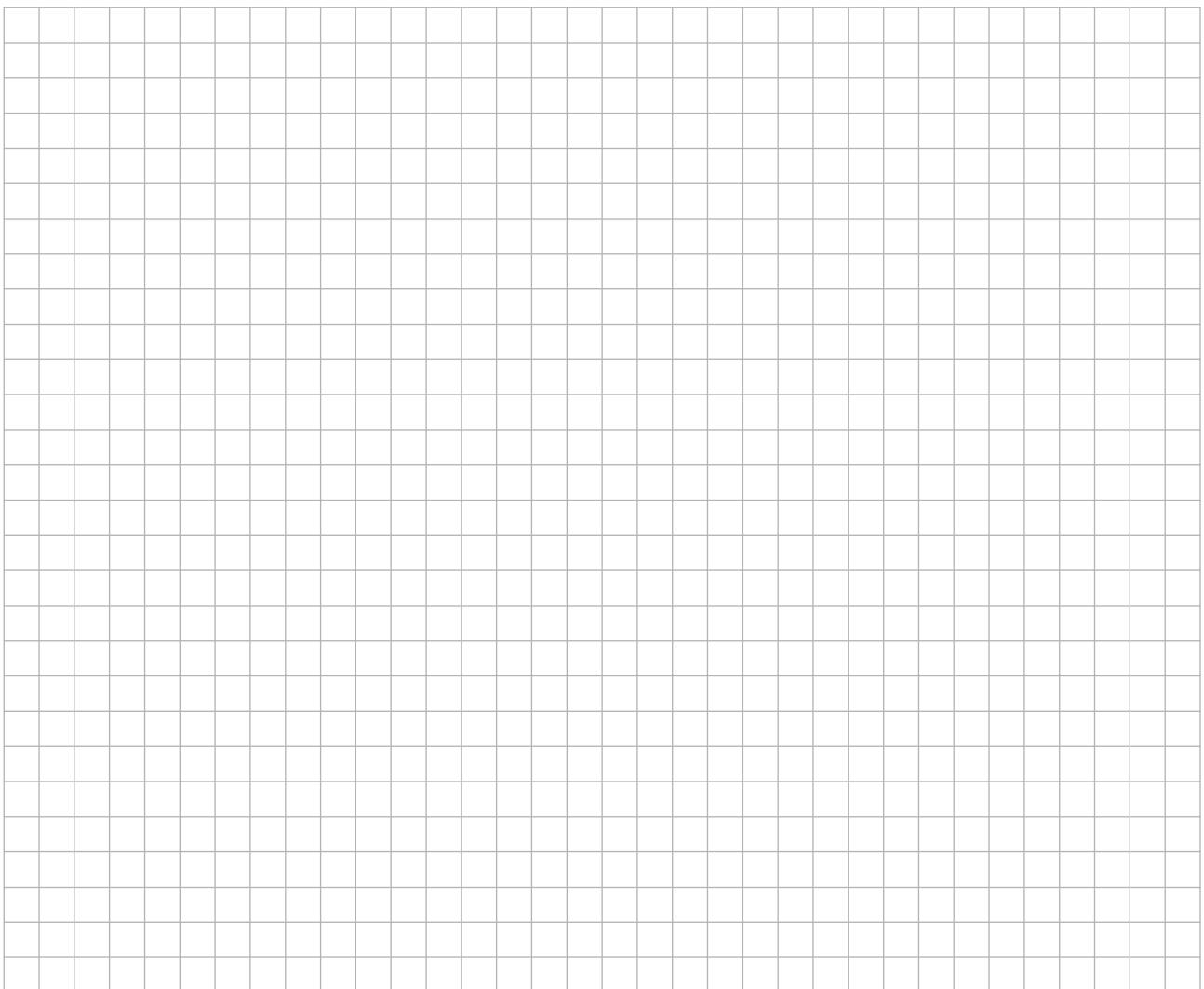
You may use this page for extra work

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