Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
Level 1/Level 2 GCSE (9–1)

Centre Number | | | | | |

Candidate Number | | | | |

Thursday 7 November 2019

Morning (Time: 1 hour 30 minutes) | Paper Reference **1MA1/2H**

Mathematics

Paper 2 (Calculator)
Higher Tier

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- You must **show all your working**.
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.

Information

- The total mark for this paper is 80
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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6/1/1/

P 5 8 8 7 4 A 0 1 2 4

Pearson

Answer ALL questions.

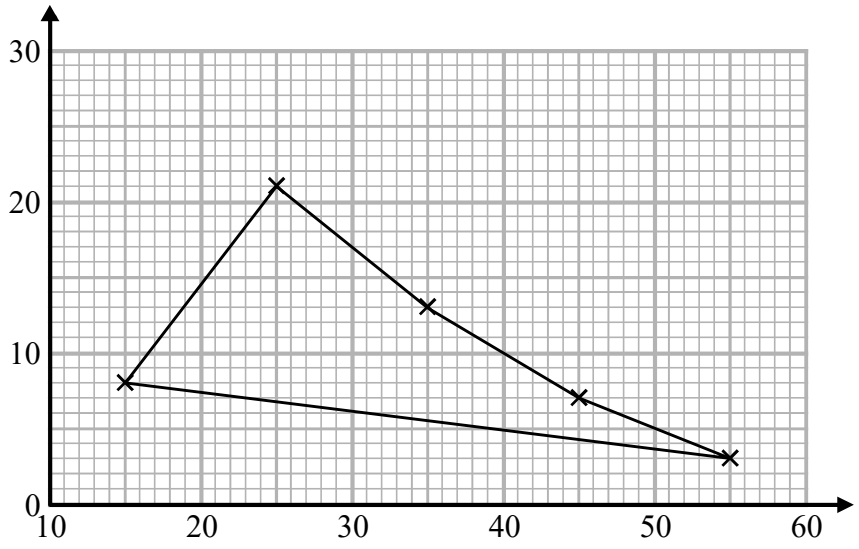
Write your answers in the spaces provided.

You must write down all the stages in your working.

1 The table shows some information about the weights of 50 potatoes.

Weight (w grams)	Frequency
$10 < w \leqslant 20$	6
$20 < w \leqslant 30$	21
$30 < w \leqslant 40$	13
$40 < w \leqslant 50$	7
$50 < w \leqslant 60$	3

Iveta drew this frequency polygon for the information in the table.
The frequency polygon is **not** fully correct.



Write down **two** things that are wrong with the frequency polygon.

1 The first point should be at (15, 6)

2 The first and last points should not be joined

(Total for Question 1 is 2 marks)

2 The length of a pencil is 128 mm correct to the nearest millimetre.

Complete the error interval for the length of the pencil.

127.5 mm ⩽ length < 128.5 mm

(Total for Question 2 is 2 marks)

3 Tom and Adam have a total of 240 stamps.
The ratio of the number of Tom's stamps to the number of Adam's stamps is 3 : 7

Tom buys some stamps from Adam.
The ratio of the number of Tom's stamps to the number of Adam's stamps is now 3 : 5

How many stamps does Tom buy from Adam?
You must show all your working.

3 : 7

$\frac{240}{10} = 24$

24 24 24 : 24 24 24 24 24 24 24

3 × 24 : 7 × 24

72 : 168

3 : 5

$\frac{240}{8} = 30$

30 30 30 : 30 30 30 30 30

3 × 30 : 5 × 30

90 : 150

90 − 72 18

(Total for Question 3 is 4 marks)

4 Each person in a fitness club is going to get a free gift.
Stan is going to order the gifts.

Stan takes a sample of 50 people in the fitness club.
He asks each person to tell him the gift they would like.

The table shows information about his results.

Gift	Number of people
sports bag	17
gym towel	7
headphones	11
voucher	15

There are 700 people in the fitness club.

(i) Work out how many sports bags Stan should order.

$\frac{700}{50} = 14$

17×14

238

(2)

(ii) Write down any assumption you made **and** explain how this could affect your answer.

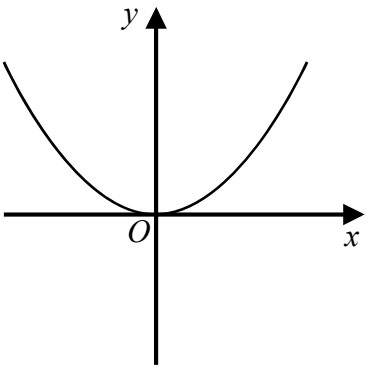
The people in the sample are representitive of all the people in the fitness club. If they are not the answer would not be accurate.

(1)

(Total for Question 4 is 3 marks)

5 Here are six graphs.

A



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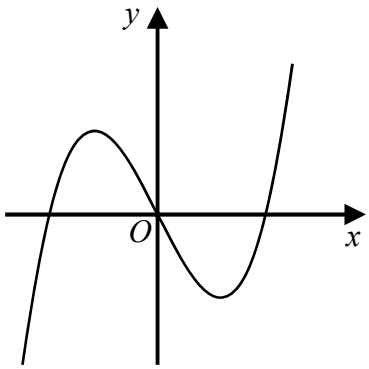

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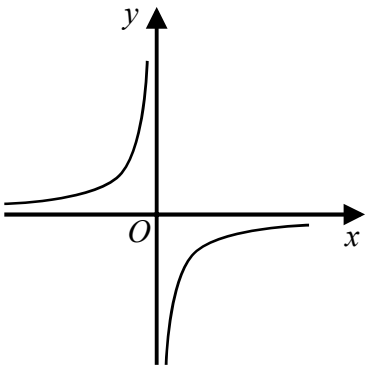

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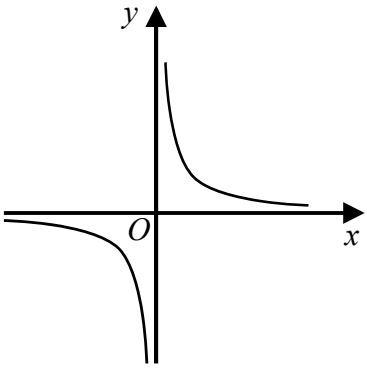

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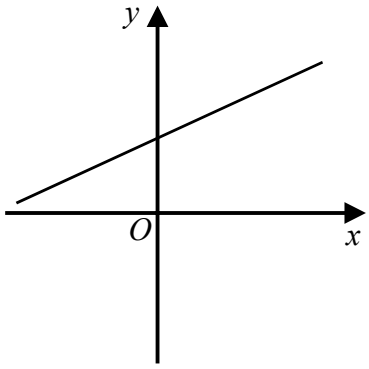
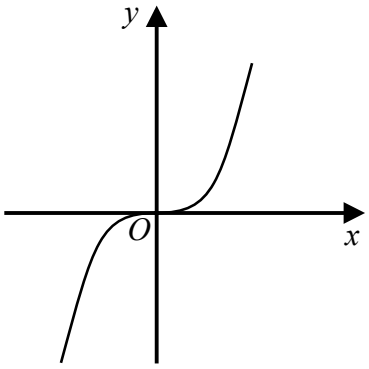


F



Write down the letter of the graph that could have the equation

(a) $y = x^3$

F

(1)

(b) $y = \frac{1}{x}$

D

(1)

(Total for Question 5 is 2 marks)

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6 The nth term of a sequence is $2n^2 - 1$

The nth term of a different sequence is $40 - n^2$

Show that there is only one number that is in both of these sequences.

$2(1)^2 - 1 = 1$ $\quad$ $40 - (1)^2 = 39$

$2(2)^2 - 1 = 7$ $\quad$ $40 - (2)^2 = 36$

$2(3)^2 - 1 = 17$ $\quad$ $40 - (3)^2 = 31$

$2(4)^2 - 1 = 31$ $\quad$ $40 - (4)^2 = 24$

$2(4)^2 - 1 = 49$ $\quad$ $40 - (5)^2 = 15$

$40 - (6)^2 = 4$

$40 - (7)^2 = -9$

(Total for Question 6 is 3 marks)

7 Work out $(3.42 \times 10^{-7}) \div (7.5 \times 10^{-6})$
Give your answer in standard form.

0.0456

4.56×10^{-2}

(Total for Question 7 is 2 marks)

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8 The number of days, d, that it will take to build a house is given by

$$d = \frac{720}{n}$$

$dn = 720$

$n = \frac{720}{d}$

where n is the number of workers used each day.

Ali's company will take 40 days to build the house.
Hayley's company will take 30 days to build the house.

Hayley's company will have to use more workers each day than Ali's company.

How many more?

Ali

$n = \frac{720}{40}$

$= 18$

Hayley

$n = \frac{720}{30}$

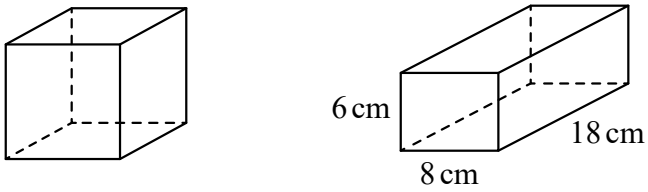
$= 24$

$24 - 18 = 6$

6

(Total for Question 8 is 3 marks)

9 The diagram shows a cube and a cuboid.



The total surface area of the cube is equal to the total surface area of the cuboid.

Janet says,

"The volume of the cube is equal to the volume of the cuboid."

Is Janet correct?
You must show how you get your answer.

surface area :

Front	6×8	=	48
Back		=	48
Top	8×18	=	144
Bottom		=	144
Side	6×18	=	108
Side		=	108
			600 cm^2

A cube has 6 faces

$\frac{600}{6} = 100\ cm^2$

$\sqrt{100} = 10$ (each length is 10cm)

volume of cube $= 10 \times 10 \times 10$

$= 1000\ cm^3$

volume of cuboid $= 6 \times 8 \times 18$

$= 864\ cm^3$

No.

(Total for Question 9 is 5 marks)

10 Make k the subject of the formula $y = \sqrt{2m - k}$

$$y^2 = 2m - k$$

$$y^2 + k = 2m$$

$$k = 2m - y^2$$

$k = 2m - y^2$

(Total for Question 10 is 2 marks)

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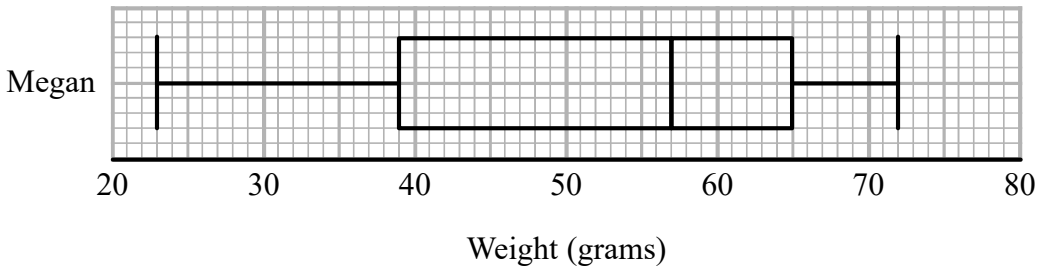
11 Megan grows potatoes.

The box plot below shows information about the weights of Megan's potatoes.



Megan says that half of her potatoes weigh less than 50 grams each.

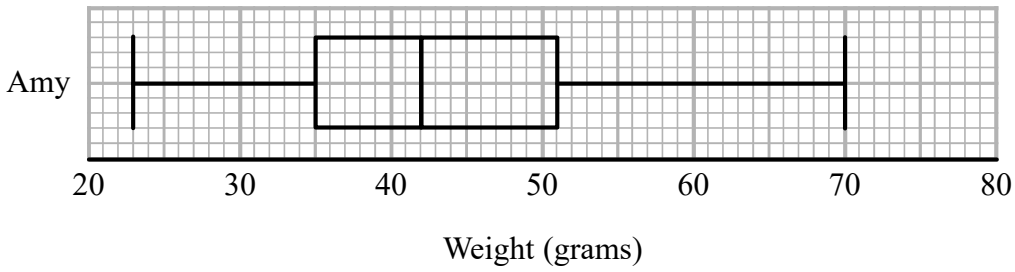
(a) Is Megan correct?
Give a reason for your answer.

No. The median is 57. (so half the potatoes weigh less than 57g)

(1)

Amy also grows potatoes.

The box plot below shows information about the weights of Amy's potatoes.



(b) Compare the distribution of the weights of Megan's potatoes with the distribution of the weights of Amy's potatoes.

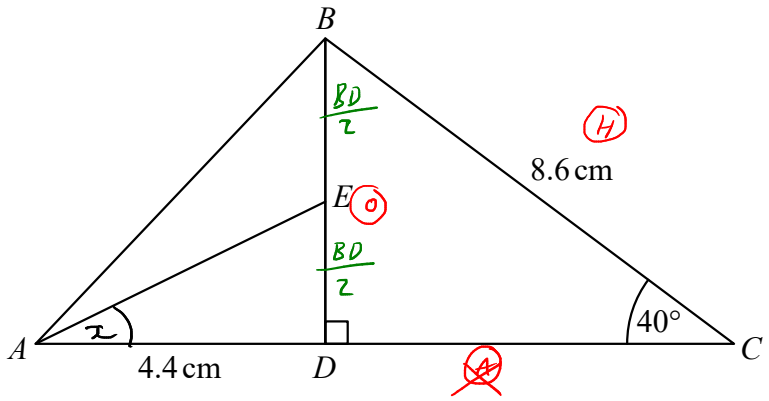
On average Amy's potatoes weigh less, they have a lower median

The weights of Amy's potatoes are less spread out they have a smaller interquartile range.

(2)

(Total for Question 11 is 3 marks)

12 The diagram shows triangle *ABC*.



ADC and *DEB* are straight lines.

AD = 4.4 cm
BC = 8.6 cm
E is the midpoint of *DB*.

Angle *CDB* = 90°
Angle *DCB* = 40°

Work out the size of angle *EAD*.
Give your answer correct to 1 decimal place.
You must show all your working.

$\sin\theta = \frac{O}{H}$

$\sin(40) = \frac{BD}{8.6}$

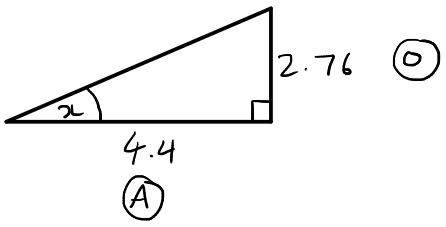
$8.6\sin(40) = BD$

$BD = 5.52797...$

$ED = \frac{BD}{2}$

$= \frac{5.52797...}{2}$

$= 2.7639...$



$\tan x = \frac{O}{A}$

$= \frac{2.76}{4.4}$

$x = \tan^{-1}\left(\frac{2.76}{4.4}\right)$

$= 32.1°$

32.1 °

(Total for Question 12 is 4 marks)

13 Sakira invested £3550 in a savings account for 3 years.

She was paid 2.6% per annum compound interest for each of the first 2 years.
She was paid R% interest for the third year.

Sakira had £3819.21 in her savings account at the end of the 3 years.

Work out the value of R.
Give your answer correct to 1 decimal place.

$3550 \times 1.026^2 \times x = 3819.21$

$x = \dfrac{3819.21}{3550 \times 1.026^2}$

$= 1.02199$

$= 1.022$

$x = 102.2\%$

$R = 2.2\%$

2.2

(Total for Question 13 is 3 marks)

14 Sadia is going to buy a new car.
For the car, she can choose one body colour, one roof colour and one wheel type.

She can choose from

19 different body colours
25 different wheel types

The total number of ways Sadia can choose the body colour and the roof colour and the wheel type is 3325

Work out the number of different roof colours that Sadia can choose from.

$19 \times R \times 25 = 3325$

$R = \frac{3325}{19 \times 25}$

$= 7$

7

(Total for Question 14 is 2 marks)

15 Expand and simplify $(3x + 2)(2x + 1)(x - 5)$

$(6x^2 + 3x + 4x + 2)(x - 5)$

$(6x^2 + 7x + 2)(x - 5)$

$6x^3 - 30x^2 + 7x^2 - 35x + 2x - 10$

$6x^3 - 23x^2 - 33x - 10$

$6x^3 - 23x^2 - 33x - 10$

(Total for Question 15 is 3 marks)

16 Marek has 9 cards.
There is a number on each card.

1	2	3	4	5	6	7	8	9

Marek takes at random two of the cards.
He works out the product of the numbers on the two cards.

Work out the probability that the product is an even number.

odd x odd = odd
odd x even = even or even x odd = even
even x even = even

$P(\text{odd}) = \frac{5}{9} \times \frac{4}{8} = \frac{5}{18}$

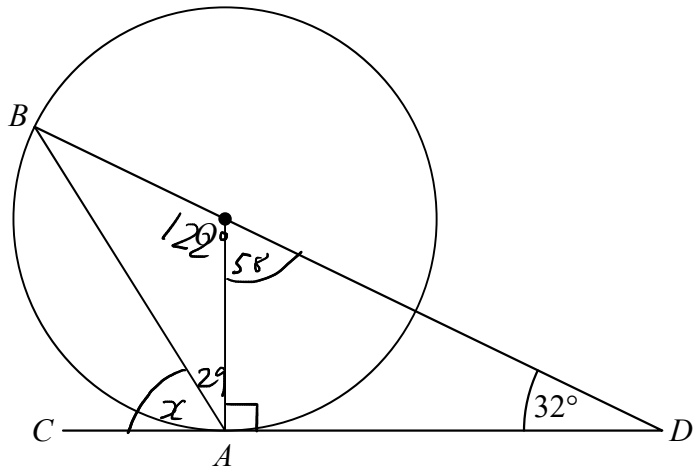
$P(\text{even}) = 1 - \frac{5}{18}$

$= \frac{13}{18}$

$\frac{13}{18}$

(Total for Question 16 is 3 marks)

17



A and *B* are points on a circle with centre *O*.
CAD is the tangent to the circle at *A*.
BOD is a straight line.

Angle *ODA* = 32°

Work out the size of angle *CAB*.
You must show all your working.

$OAD = 90°$ Tangent meets radius at $90°$

$AOD = 58°$ Angles in a triangle add to $180°$

$AOB = 122°$ Angles on a straight line add to $180°$

$BAO = \frac{180 - 122}{2}$ Angles at the base of an isosceles triangle are equal

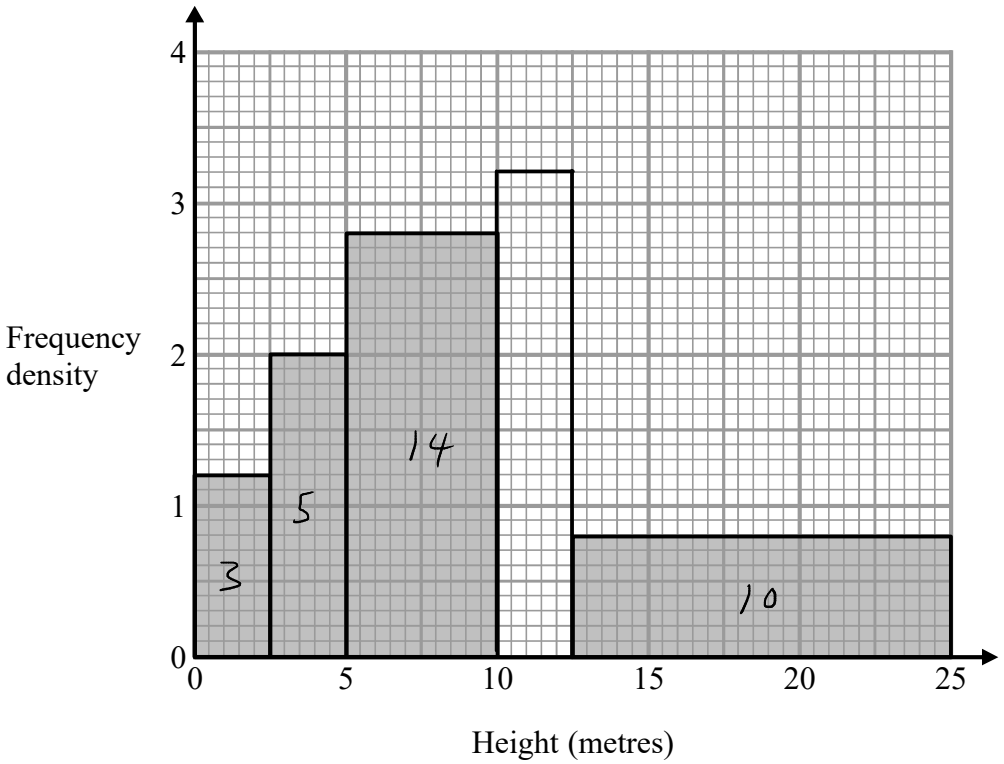
$= 29°$

$x = 90 - 29 = 61°$

61 °

(Total for Question 17 is 3 marks)

18 The histogram gives information about the heights, in metres, of the trees in a park.
The histogram is incomplete.



20% of the trees in the park have a height between 10 metres and 12.5 metres.
None of the trees in the park have a height greater than 25 metres.

Complete the histogram.

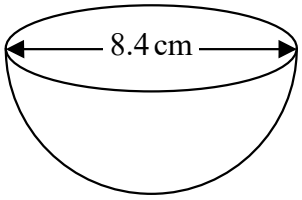
$2.5 \times 1.2 = 3$
$2.5 \times 2 = 5$
$5 \times 2.8 = 14$
$12.5 \times 0.8 = 10$
32

32 = 80% of all trees
$\div 4 \quad \div 4$
8 = 20% of all trees

$\frac{8}{2.5} = 3.2$
Width, Height

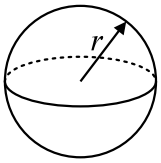
(Total for Question 18 is 3 marks)

19 The diagram shows a hemisphere with diameter 8.4 cm.



$r = 4.2$

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



Work out the volume of the hemisphere.
Give your answer correct to 3 significant figures.

volume of hemisphere $= \frac{2}{3}\pi r^3$

$= \frac{2}{3}\pi (4.2)^3$

$= 155$

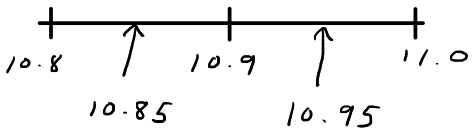
155 cm^3

(Total for Question 19 is 2 marks)

20 $d = \frac{1}{8}c^3$

$c = 10.9$ correct to 3 significant figures.

By considering bounds, work out the value of d to a suitable degree of accuracy.
Give a reason for your answer.



Lower d $= \frac{1}{8}(10.85)^3$

$= 159.661...$

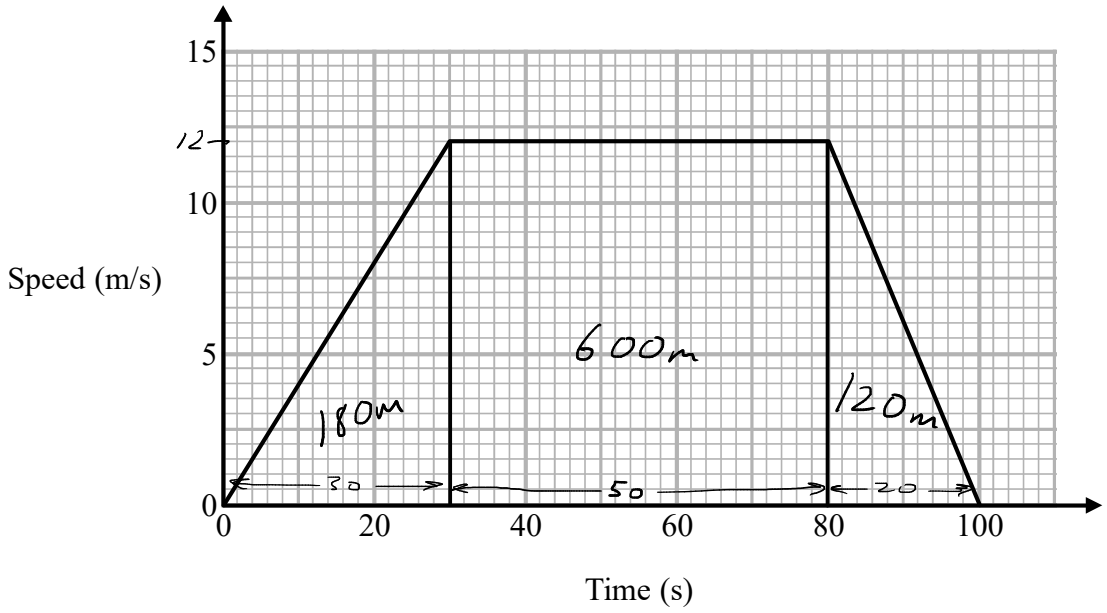
upper d $= \frac{1}{8}(10.95)^3$

$= 164.116...$

Both round to 160 (2sf)

(Total for Question 20 is 4 marks)

21 Here is a speed-time graph for a train journey between two stations.
The journey took 100 seconds.



(a) Calculate the time taken by the train to travel half the distance between the two stations.
You must show all your working.

Distance = Area under graph

$\frac{1}{2} \times 30 \times 12 = 180$ $\quad 50 \times 12 = 600$

$\frac{1}{2} \times 20 \times 12 = 120$

$180 + 120 + 600 = 900m$

$\frac{900}{2} = 450m$ $\quad \frac{270}{12} = 22.5$ seconds

$450 - 180 = 270m$

$22.5 + 30 = 52.5$

52.5 seconds

(4)

(b) Compare the acceleration of the train during the first part of its journey with the acceleration of the train during the last part of its journey.

The acceleration is positive in the first part and negative in the last part

or The acceleration in the last part is greater than in the first part

(1)

(Total for Question 21 is 5 marks)

22 The number of rabbits on a farm at the end of month n is P_n
The number of rabbits at the end of the next month is given by $P_{n+1} = 1.2P_n - 50$

At the end of March there are 200 rabbits on the farm.

(a) Work out how many rabbits there will be on the farm at the end of June.

April: $P = 1.2(200) - 50$
$= 190$

May: $P = 1.2(190) - 50$
$= 178$

June: $P = 1.2(178) - 50$
$= 163.6$

164

(3)

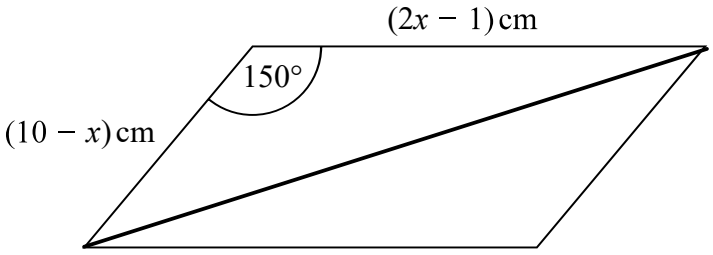
(b) Considering your results in part (a), suggest what will happen to the number of rabbits on the farm after a long time.

The number will keep reducing until there are no rabbits.

(1)

(Total for Question 22 is 4 marks)

23 The diagram shows a parallelogram.



The area of the parallelogram is greater than 15 cm^2

(a) Show that $2x^2 - 21x + 40 < 0$

Area of triangle $> \frac{15}{2}$

$\frac{1}{2}(10-x)(2x-1)\sin 150 > \frac{15}{2}$ $\quad \sin 150 = \frac{1}{2}$

$\frac{1}{2}(20x - 10 - 2x^2 + x)\left(\frac{1}{2}\right) > \frac{15}{2}$

$\frac{1}{4}(21x - 2x^2 - 10) > \frac{15}{2}$

$21x - 2x^2 - 10 > 30$

$-2x^2 + 21x - 40 > 0$

$2x^2 - 21x + 40 < 0$

(3)

(b) Find the range of possible values of x.

$2x^2 - 5x - 16x + 40 < 0$

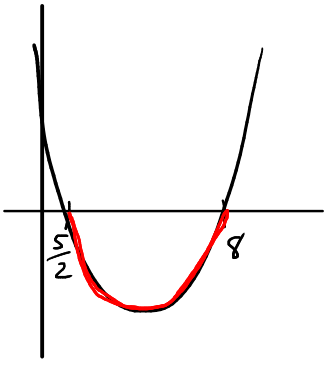
$(x - 8)(2x - 5) < 0$

$x = 8 \quad x = \frac{5}{2}$

$2 \times 40 = 80$

80

1	80
2	40
4	20
5	16
8	10

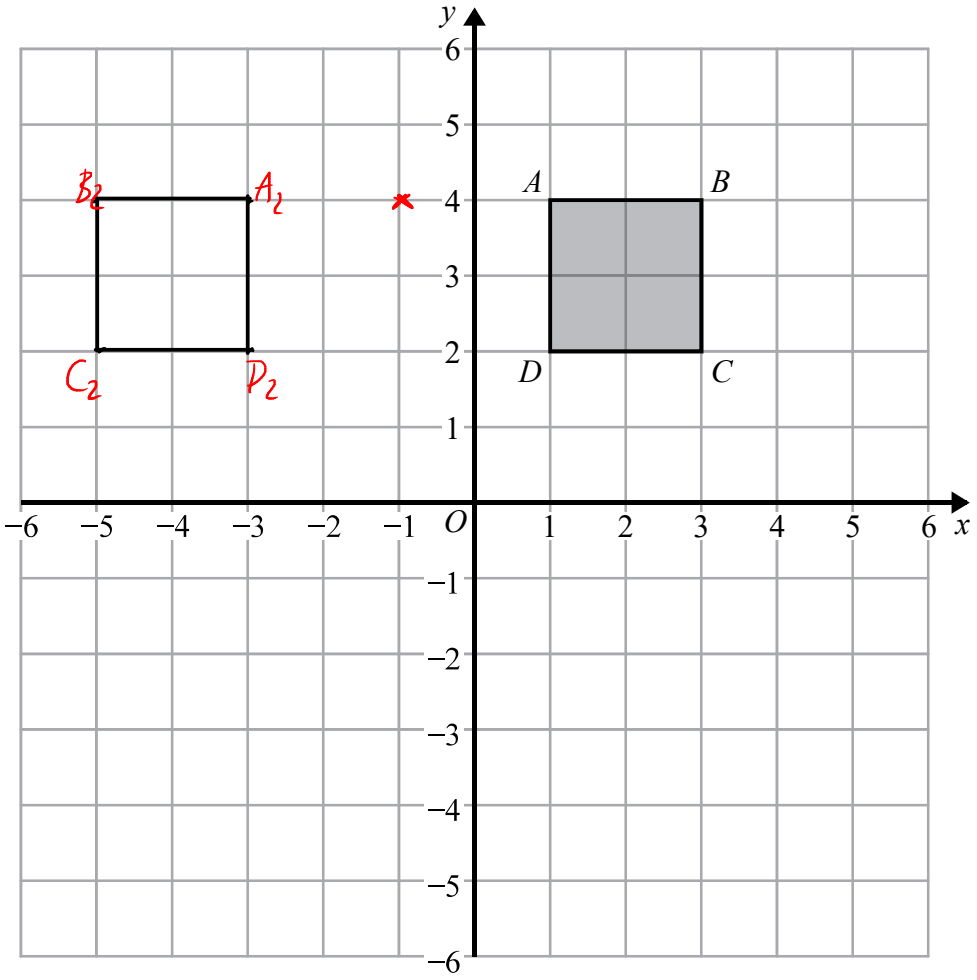


$\frac{5}{2} < x < 8$

(3)

(Total for Question 23 is 6 marks)

24



Square *ABCD* is transformed by a combined transformation of a reflection in the line $x = -1$ followed by a rotation.

Under the combined transformation, two vertices of the square *ABCD* are invariant. unmoved.

Describe fully one possible rotation.

Rotation, 180°, centre (−1, 4)

(Total for Question 24 is 2 marks)

OR Rotation, 180°, centre (−1, 2) For C and D to be invariant

OR Rotation, 90° clockwise centre (−1, 0) B and D

OR Rotation 90° anticlockwise centre (−1, 6) A and C

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25 The straight line **L** has equation $3x + 2y = 17$

The point A has coordinates (0, 2)
The straight line **M** is perpendicular to **L** and passes through A.

Line **L** crosses the y-axis at the point B.
Lines **L** and **M** intersect at the point C.

Work out the area of triangle ABC.
You must show all your working.

$3x + 2y = 17$

$2y = -3x + 17$

L: $y = -\frac{3}{2}x + \frac{17}{2}$ $\quad m = -\frac{3}{2}$

perpendicular $m = \frac{2}{3}$

M: $y = \frac{2}{3}x + 2$

Point B: $(0, \frac{17}{2})$ Point A: $(0, 2)$

L and M intersect where

$-\frac{3}{2}x + \frac{17}{2} = \frac{2}{3}x + 2$

$-3x + 17 = \frac{4}{3}x + 4$

$-9x + 51 = 4x + 12$

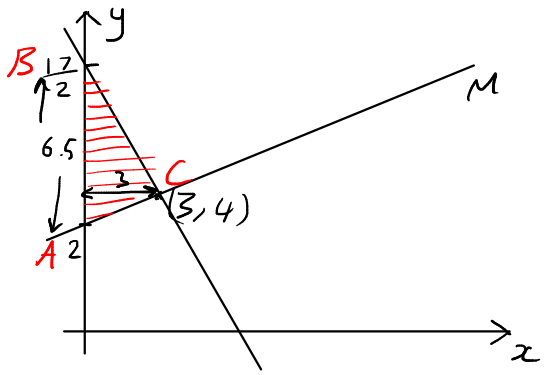
$39 = 13x$

$x = 3$

$y = \frac{2}{3}(3) + 2$

$= 4$

Point C (3,4)



Area $= \frac{1}{2}(6.5)(3)$

$= 9.75$

9.75

(Total for Question 25 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS

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