

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Centre Number

Candidate Number

Pi Academy

Predicted Papers - Set 2

Morning (Time: 1 hour 30 minutes)

Mathematics

Paper 3 (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 ►



Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Here are eight number cards.

1	2	2	1	4	4	2	1
---	---	---	---	---	---	---	---

Joe takes a card at random.
He does not replace the card.

Joe then takes another card at random.

(a) Calculate the probability that both cards have the same number on them.

.....
(3)

(b) Calculate the probability that the number on the second card Joe takes is smaller than the number on the first card he takes.

.....
(3)

(Total for Question 1 is 6 marks)

- 2 During the Christmas season, Mr Green manufactures stars made of Iron and sells them. He sells each star for £126 which is a 40% profit on the cost of manufacturing. He wants to increase his profit to 90%.

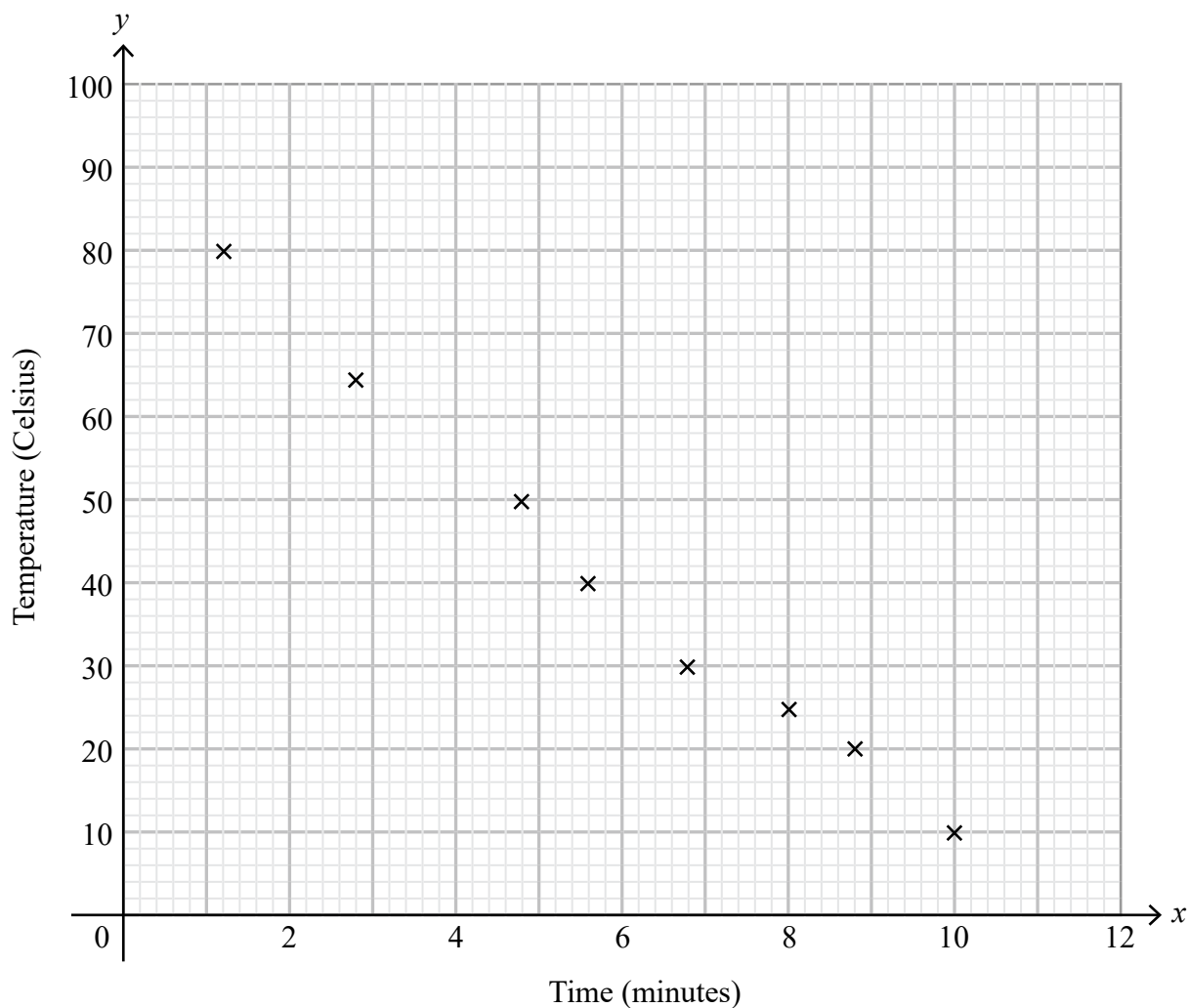
How much should Mr Green start charging per star?

£

(Total for Question 2 is 3 marks)

3 The Temperature of the cup of tea is recorded over time.

The scatter graph shows this information.



(a) What type of correlation does the scatter graph show?

.....

(1)

(b) What is the estimate of the temperature of the cup of tea after 4 minutes?

..... °C

(2)

- (c) Janine wants to use the scatter graph to predict the temperature of the cup of tea after 12 minutes.
Comment on the reliability of this prediction.

.....

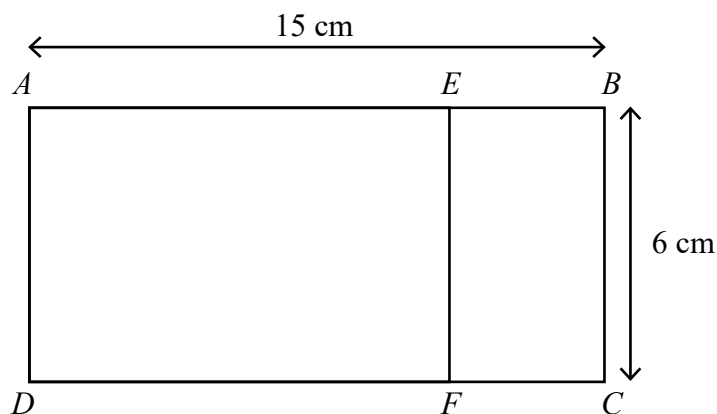
.....

.....

(1)

(Total for Question 3 is 4 marks)

- 4 Rectangle $ABCD$ is mathematically similar to rectangle $FEBC$.



$$AB = 15 \text{ cm}$$

$$BC = 6 \text{ cm}$$

Work out the area of rectangle $FEBC$.

..... cm^2

(Total for Question 4 is 3 marks)

- 5 $z = a + b$
 $a = 2.344$ correct to 4 significant figures.
 $b = 0.128$ correct to 3 significant figures.

By considering bounds for a & b , work out the value of upper bound and lower bound for z .
You must show your working.

$$\dots\dots\dots \leq z < \dots\dots\dots$$

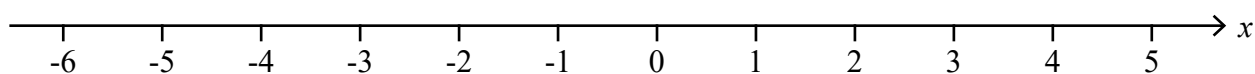
(Total for Question 5 is 3 marks)

- 6 (a) Solve $m^2 - 16 \leq 9$

$$\dots\dots\dots \leq m \leq \dots\dots\dots$$

(2)

- (b) Solve the inequality $-7 \leq 6x + 17 < 35$ and represent the solution on the number line.



(3)

(Total for Question 6 is 5 marks)

7 Mike pays £4.50 per 800 g of butter.

He uses 250 g of butter to make 2 medium size vanilla cakes.

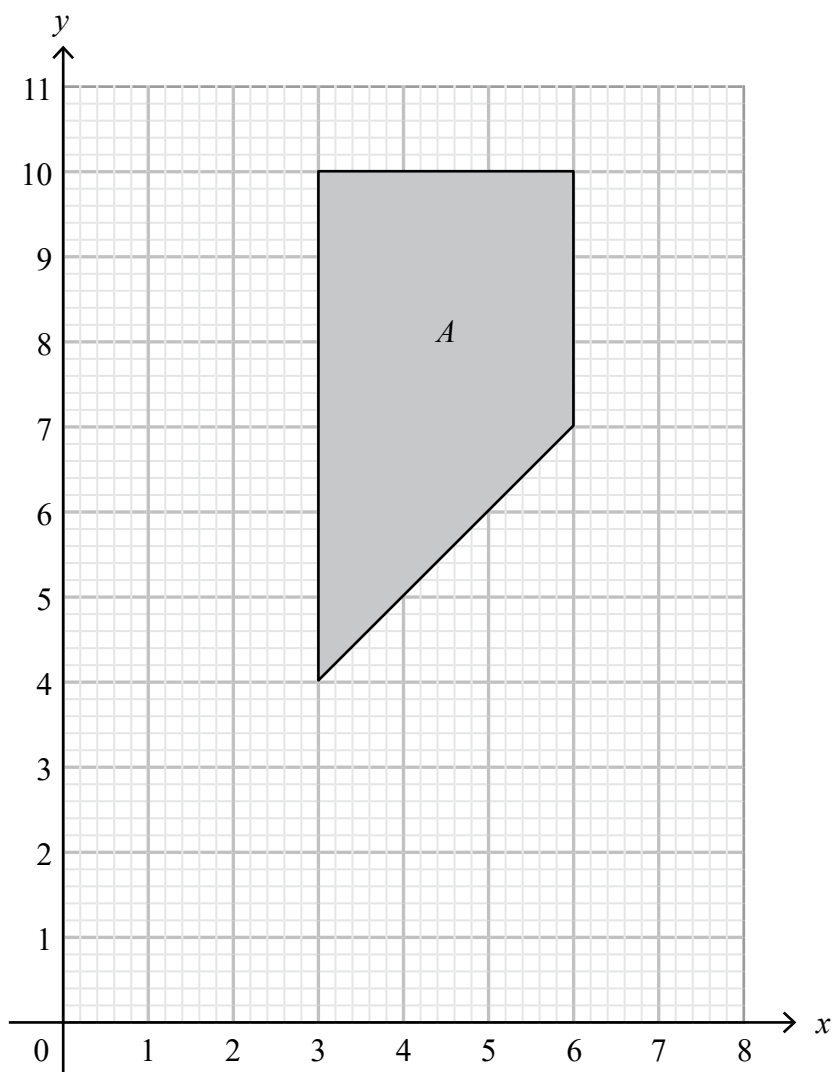
How much would the butter cost if he wanted to make 8 medium size vanilla cakes?

Give your answer correct to 3 significant figures.

£

(Total for Question 7 is 2 marks)

8



On the grid, enlarge the shape *A* by scale factor $\frac{1}{3}$ centre (0,1)

(Total for Question 8 is 2 marks)

9 Rearrange the formula below to make n the subject.

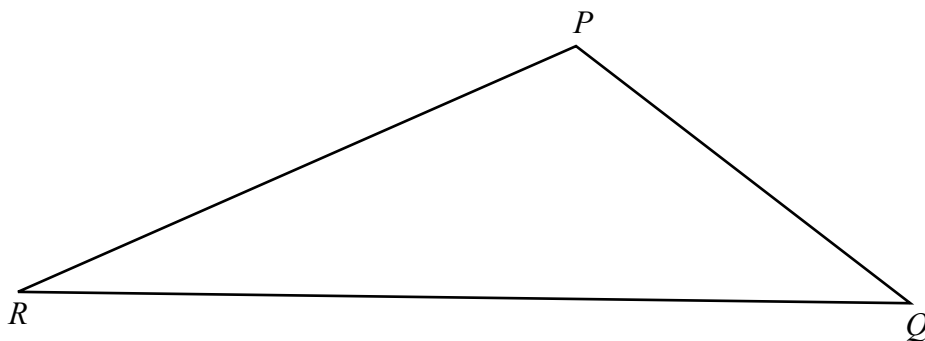
$$x = \sqrt{\frac{n}{\sqrt{2} - n}}$$

.....

(Total for Question 9 is 4 marks)

10 PQR is a triangle.

Find and shade the region inside the triangle which is both closer to line PQ than the line QR , and also more than 7 cm from point R .



(Total for Question 10 is 3 marks)

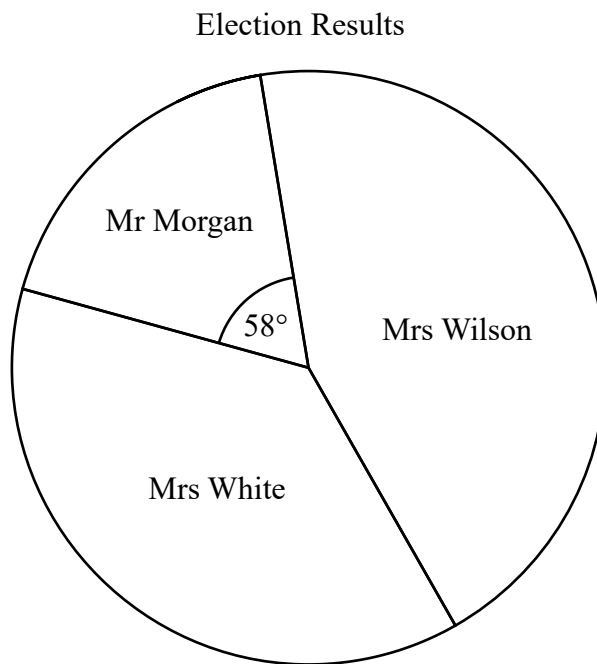
11 The coach of a football team buys 7 footballs and 4 pairs of goalkeeper gloves for £174. Later he buys 9 footballs and 3 pairs of goalkeeper gloves for £198. Work out the cost of each football and a pair of goalkeeper gloves.

Football £

Pair of goalkeeper gloves £

(Total for Question 11 is 3 marks)

- 12** The pie chart shows some information about the share of votes for candidates in an election.



The angle for Mrs Wilson would be 26° more than the angle for Mrs White. There were 5940 votes in total. Work out the difference between the highest and lowest number of votes.

.....

(Total for Question 12 is 4 marks)

- 13** Mango Squash is made of water and concentrate in the ratio 12:3.

(a) What fraction of the squash is water? Give your answer in its simplest form.

.....

(1)

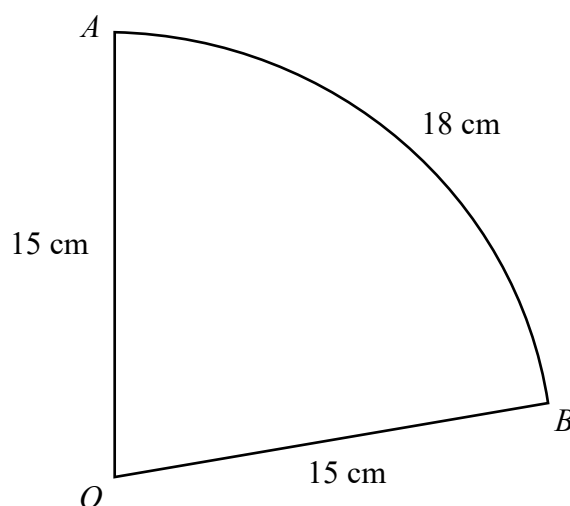
(b) How many litres of water are needed to make 2.95 litres of Mango squash?

..... litres

(2)

(Total for Question 13 is 3 marks)

- 14 AOB is a sector of a circle, centre O and radius 15 cm.
The length of arc AB is 18 cm.



Find the area of the sector.
Give your answer correct to 3 significant figures.

..... cm^2

(Total for Question 14 is 4 marks)

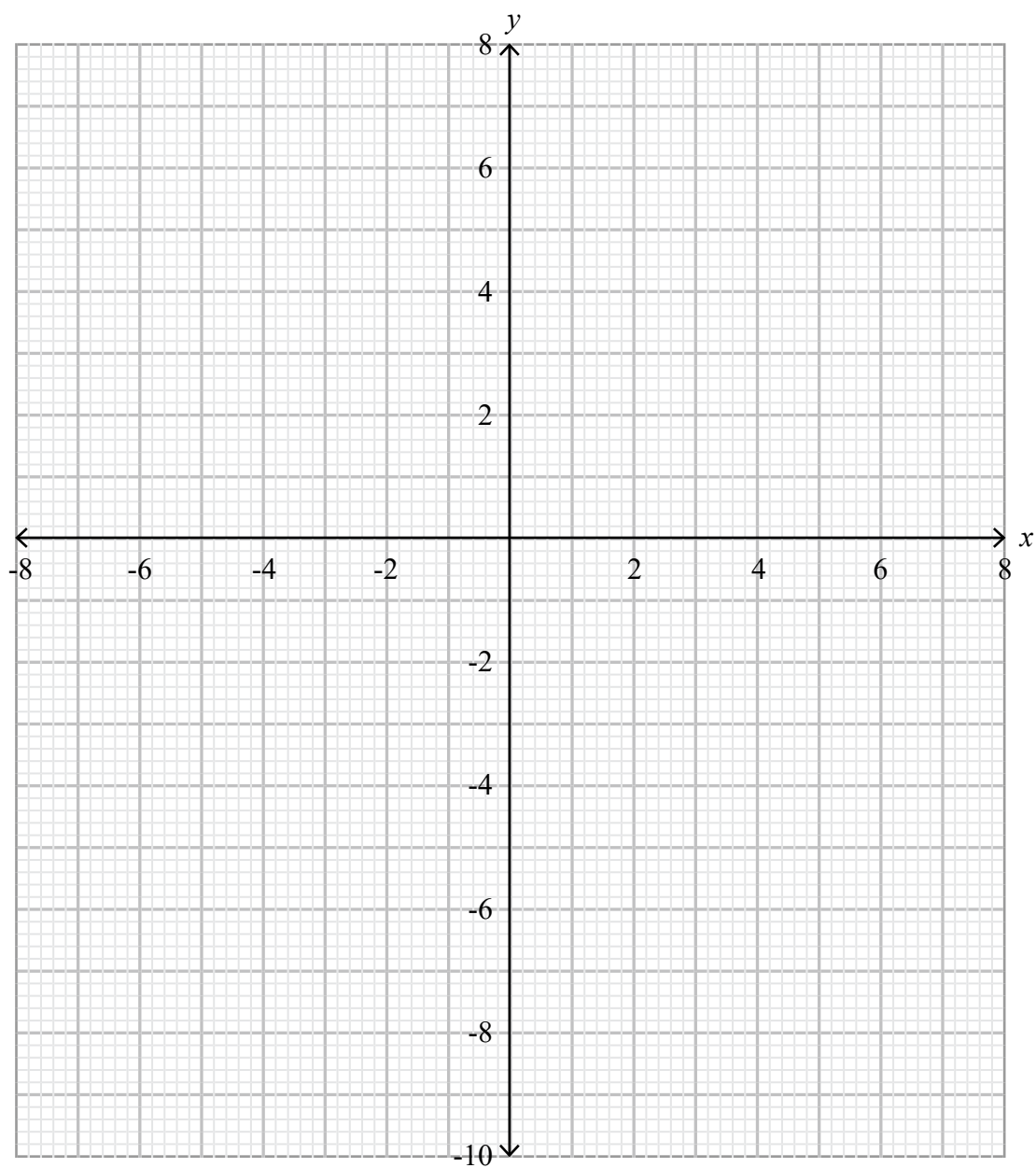
15 The values for the equation $y = x^2 - 4x - 5$ is given in the table below.

x	-2	4	6	0		
y				-5	-8	-8

(a) Complete the above table.

(2)

(b) Using the values from the table, sketch the graph of the equation $y = x^2 - 4x - 5$.



(2)

(c) On the graph, label the turning points and x -intercepts with their coordinates.

(2)

(Total for Question 15 is 6 marks)

16 A and B are two geometrically similar solid shapes.

The total surface area of shape A is 84 cm^2

The total surface area of shape B is 525 cm^2

The volume of shape A is 1276 cm^3

Calculate the volume of shape B .

..... cm^3

(Total for Question 16 is 3 marks)

17 The acceleration due to gravity (a) between the surface and a vehicle is inversely proportional to the square of the distance (d) between them.

(a) Write an equation connecting a and d .

.....

(2)

(b) Find k , When $d = 20$, $a = 4$.

.....

(1)

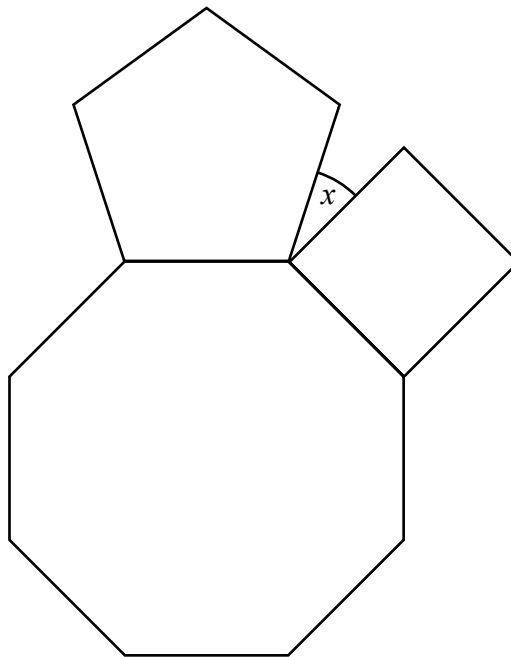
(c) Find the value of a when $d = 10$.

.....

(1)

(Total for Question 17 is 4 marks)

18



The diagram shows a square, a pentagon and an octagon meeting at a point.

Work out the size of the angle marked x .

You must show all your working.

.....°

(Total for Question 18 is 3 marks)

19 (a) Write $9x^2 - 15x + 6$ in the form of $a(x + b)^2 + c$.

.....
(4)

(b) Hence solve $9x^2 - 15x + 6 = 0$.

.....
(2)

(Total for Question 19 is 6 marks)

20 Daisy bakes 140 cookies.

She bakes only chocolate cookies, almond cookies, pistachio cookies and sugar free cookies.

$\frac{3}{5}$ of the cookies are chocolate cookies.

25% of the remaining cookies are almond cookies.

There is an equal number of pistachio and sugar free cookies.

Work out the number of sugar free cookies.

.....

(Total for Question 20 is 3 marks)

21 Express $\frac{6+3\sqrt{3}}{3-\sqrt{3}}$ in the form of $a + b\sqrt{3}$ where a and b are fractions.

.....

(Total for Question 21 is 4 marks)

22 A is the point $(12, -7)$ and B is the point $(-3, -1)$.

(a) Write down as a column vector $\overrightarrow{AB}$

.....

(1)

C is the point $(6, -2)$ and D is the point $(-11, 8)$.

(b) Write down as a column vector $\overrightarrow{CD}$

.....

(1)

(Total for Question 22 is 2 marks)

TOTAL FOR PAPER IS 80 MARKS