Candidate surname	Other names

Pi Academy

Centre Number

Candidate Number

Predicted Papers - Set 1

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 ▶

PiAcademy™

1 Make w the subject of the formula $r = \dfrac{2w + 1}{2w - 1}$

....

(Total for Question 1 is 1 mark)

2 Solve $x - \dfrac{x - 1}{2} = 1 - \dfrac{x - 2}{3}$

$x =$ ....

(Total for Question 2 is 3 marks)

3 (a) Work out the value of $(8 \times 10^4) \div (32 \times 10^5)$

Give your answer in ordinary form.

....

(2)

(b) $A = \sqrt{\dfrac{a^2}{b}}$

$a = 4.5 \times 10^4$
$b = 8.1 \times 10^2$

Work out the value of A.
Give your answer in standard form correct to 3 significant figures.

....

(3)

(Total for Question 3 is 5 marks)

4 The density of methanol is 1.09 g/cm³
   The density of propylene is 0.97 g/cm³

   50 litres of methanol are mixed with 130 litres of propylene to make 180 litres of MTP solution.

   Work out the density of the MTP solution.
   Give your answer correct to 2 decimal places.

   .... g/cm³

   (Total for Question 4 is 4 marks)

5 Here are seven numbered cards.

   | 2 | 2 | 4 | 4 | 4 | 5 | 6 |

   Zara takes a card at random.
   She does not replace the card.

   Zara then takes another card at random.

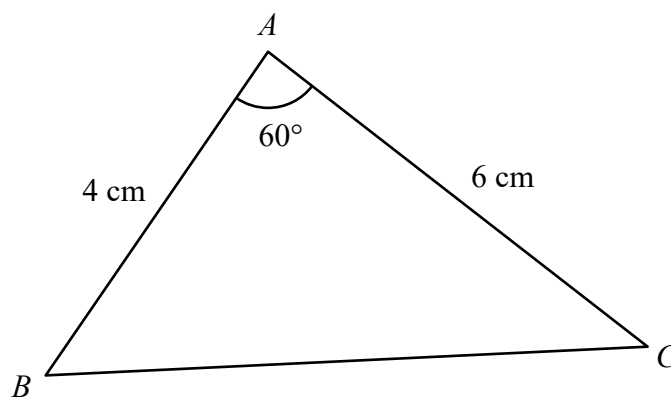   (a) Calculate the probability that both cards have the same number on them.

   ....
   (2)

(b) Calculate the probability that the number on the second card Zara takes is greater than the number on the first card she takes.

....

(3)

(Total for Question 5 is 5 marks)

6

(a) Find the area of triangle *ABC*.
Give your answer correct to two decimal places.

.... cm²

(2)

(b) Find the length of the side *BC* for triangle *ABC*.
Round your answer to one decimal place.

.... cm

(2)

(Total for Question 6 is 4 marks)

7   Laura studies the measures of angles of a regular pentagon.

She finds that the measure of the exterior angle is 72° and the measure of the interior angle is 108°.

She marks the angles on the diagram shown below.
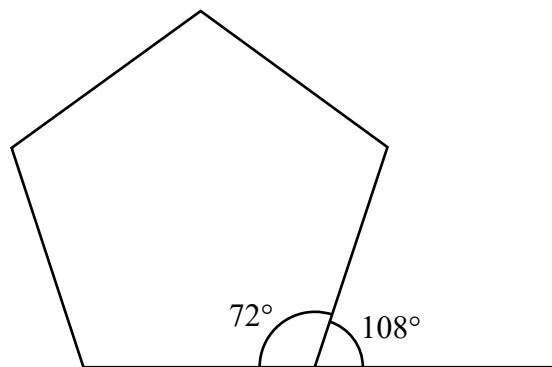
Is Laura's diagram correct? Give a reason for your answer.

....

....

....

(Total for Question 7 is 1 mark)

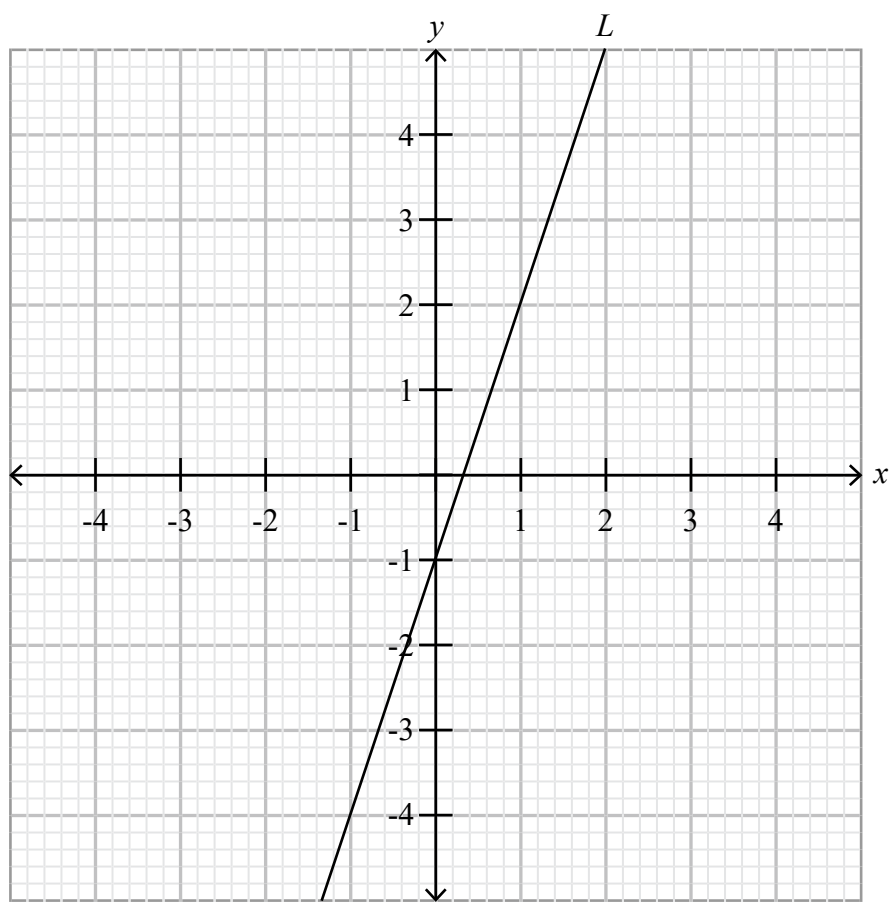**8** (a) Write $3x^2 - 12x + 6$ in the form of $a(x + b)^2 + c$ where a, b, and c are integers.

....

(3)

(b) Hence, or otherwise, write down the coordinates of the turning point of the graph of
$y = 3x^2 - 12x + 6$

....

(1)

(Total for Question 8 is 4 marks)

9 Find the equation of Line *L*.

....

(Total for Question 9 is 2 marks)

8

10 30 people were asked how many times a week they watch movies.

The table below shows the results.

No. of times movie watched	Frequency
0	4
1	6
2	8
3	7
4	5
5 or more	0

(a) Find the median.

....

(2)

(b) Calculate the mean.

....

(3)

(Total for Question 10 is 5 marks)

11 *PQRS* is a quadrilateral.

$$\overrightarrow{RS} = x + 2y$$
$$\overrightarrow{RP} = 2x + 3y$$
$$\overrightarrow{QS} = 3x - 2y$$
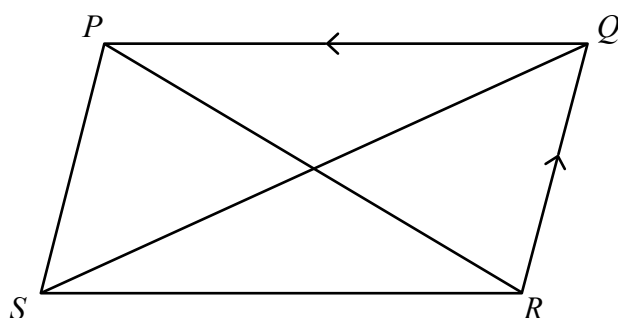
Find vector $\overrightarrow{QP}$ in terms of *x* and *y*.

....

(Total for Question 11 is 3 marks)

12 Four fair coins were tossed simultaneously.

(a) List all the possible outcomes.

....

....

....

(2)

(b) Find the probability of getting:

(i) At least 3 heads

....

(1)

(ii) At most 3 heads

....

(Total for Question 12 is 4 marks)

13 Here are the equations of four straight lines.

Line *A*　　$y = 3x - 2$
Line *B*　　$2y = -3x - 8$
Line *C*　　$3x - 2y = 6$
Line *D*　　$2y - 3x = 10$

Two of these lines are parallel.

Write down the two parallel lines.

....

(Total for Question 13 is 1 mark)

14 Mac invests £10000 in an account for one year.

At the end of the year, interest is added to his account. Mac pays tax on this interest at a rate of 15%. He pays £30 tax.

Work out the percentage interest rate for the account.

.... %

(Total for Question 14 is 3 marks)

15 Sean and Albert each get a salary of £80 per day. One day, Sean gets an increment of 30% of his salary while Albert gets an increment of $\frac{2}{5}$ of his salary.

Work out the difference between the total amounts of money that Sean and Albert each get.

£ ....

(Total for Question 15 is 2 marks)

16 The line l is a tangent to the circle $x^2 + y^2 = 13$ at the point A.
A is the point (2, 3).

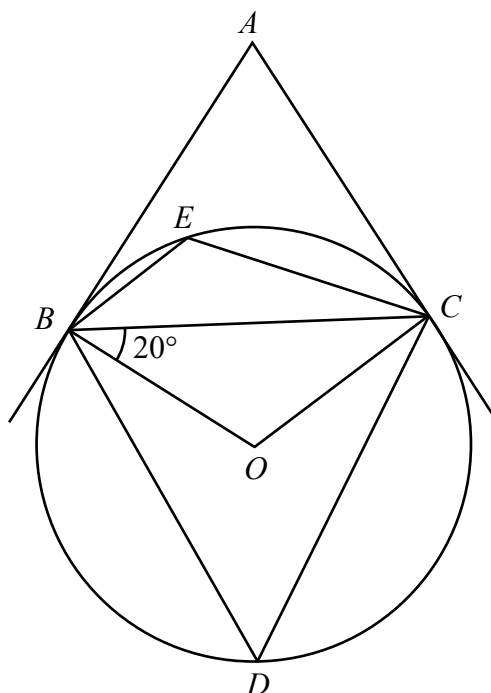Find an equation of the tangent at point A.

....

(4)

(Total for Question 16 is 4 marks)

17 In the diagram, O is the centre of the circle. B, C, D and E are points on the circumference of the circle. AB and AC are the tangents. Angle OBC is 20°.
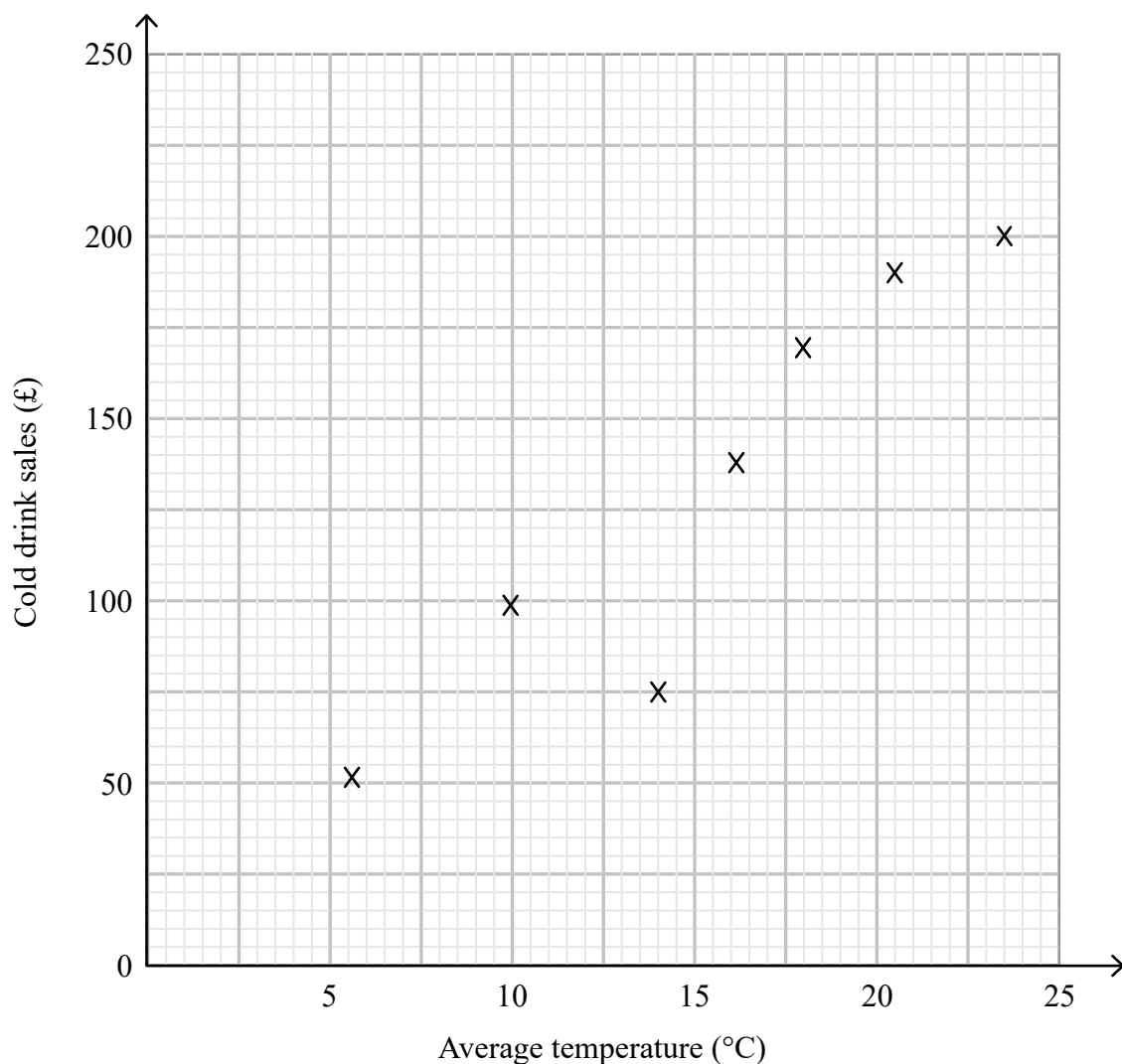

Work out the size of angles BAC and BEC.
Give reasons at each step of your working.

Angle BAC = ... °

Angle BEC = ... °

(Total for Question 17 is 5 marks)

18 The average daytime temperature for 7 days is recorded.
A shop also records its cold drink sales for each of the 7 days.
The scatter graph shows this information.

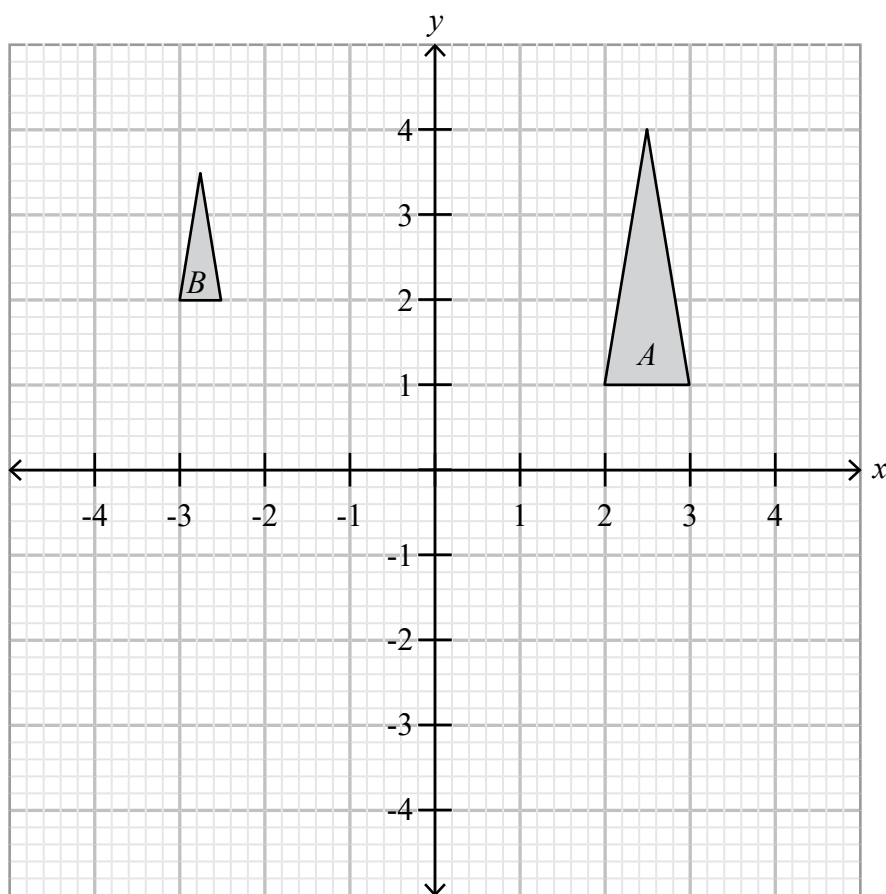(a) What type of correlation does the scatter graph show?

....
(1)

(b) One of the points is an outlier. Write down the coordinates for this point.

(........................ , ...)
(1)

(Total for Question 18 is 2 marks)

19 The diagram shows triangle *A* and triangle *B* on the grid.

Triangle *A* is rotated 180° anticlockwise about the origin to get triangle *C*.

Triangle *C* is reflected in the y-axis to get triangle *D*.
Describe the single transformation that maps from triangle *D* to triangle *B*.

You must show how you get your answer.

....

....

....

(Total for Question 19 is 4 marks)

20 Here are the first six terms of a quadratic sequence.

$$6 \quad 11 \quad 18 \quad 27 \quad 38 \quad 51$$

Find an expression in terms of n, for the nth term of this sequence.

....

(Total for Question 20 is 3 marks)

21 Factorise $3s^2 - 243$

....

(Total for Question 21 is 1 mark)

22
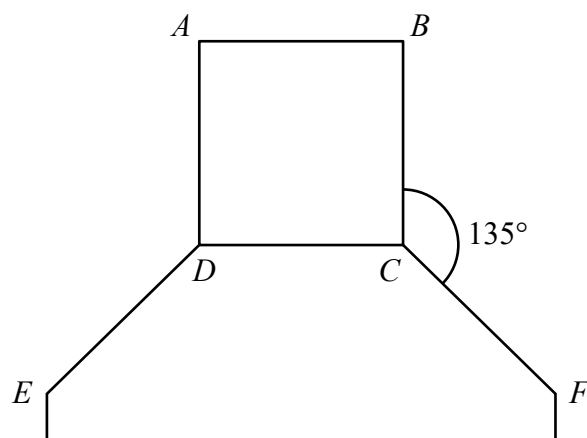
ABCD is a square. *ED*, *DC*, *CF* are sides of a regular polygon. The measure of angle *BCF* is 135°.

Find the number of sides of this regular polygon.

....

(Total for Question 22 is 3 marks)

23 Prove algebraically that the recurring decimal $0.03\dot{5}$ has the value $\dfrac{32}{900}$

(Total for Question 23 is 2 marks)

24 Cain invests £300000 in a savings account for 5 years.
The account pays compound interest at a rate of 2% per annum.

Calculate the total amount of interest Cain will get at the end of 5 years.

£ ....

(Total for Question 24 is 2 marks)

25 There was a group of workers who were given an assignment to finish in 4 days.

After the 1st day, 10 men dropped out of work, while 2 more men dropped out of work after the 2nd day and after the 3rd day, 2 more men dropped out. It went on with the same pattern of men dropping out and they finished the assignment at the end of the 6th day.

How many men were there at the beginning?

....

(Total for Question 25 is 3 marks)

26 *ABCDEF* is a triangular prism and *AD* is the diagonal of the prism.
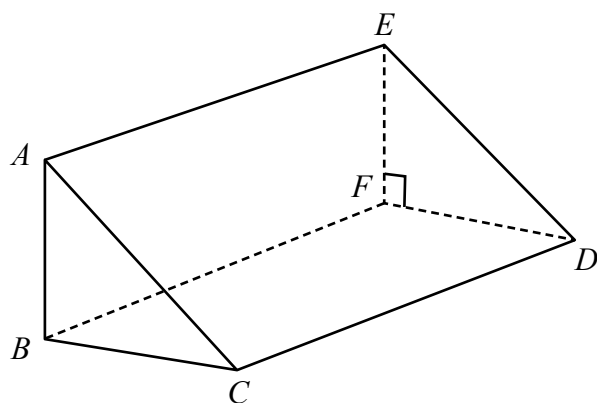
BC = 5 cm
CD = 9 cm
AB = 4 cm

Find the size of the angle *ADB*.
Give your answer correct to two decimal places.

.... °

(Total for Question 26 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS