Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

6057766904

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/53**

Paper 5 (Core) **May/June 2017**

1 hour

Candidates answer on the Question Paper.

Additional Materials: Graphics Calculator

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
Do not use staples, paper clips, glue or correction fluid.
You may use an HB pencil for any diagrams or graphs.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** the questions.
You must show all relevant working to gain full marks for correct methods, including sketches.
In this paper you will also be assessed on your ability to provide full reasons and communicate your mathematics clearly and precisely.
At the end of the examination, fasten all your work securely together.
The total number of marks for this paper is 24.

This document consists of **12** printed pages.

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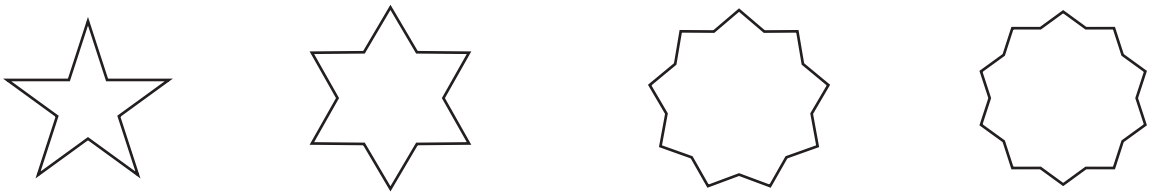
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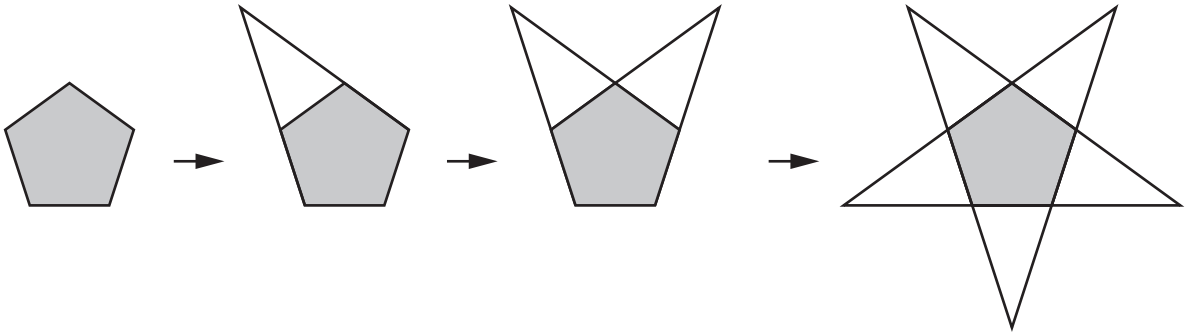
Answer **all** the questions.

INVESTIGATION **REGULAR STARS**

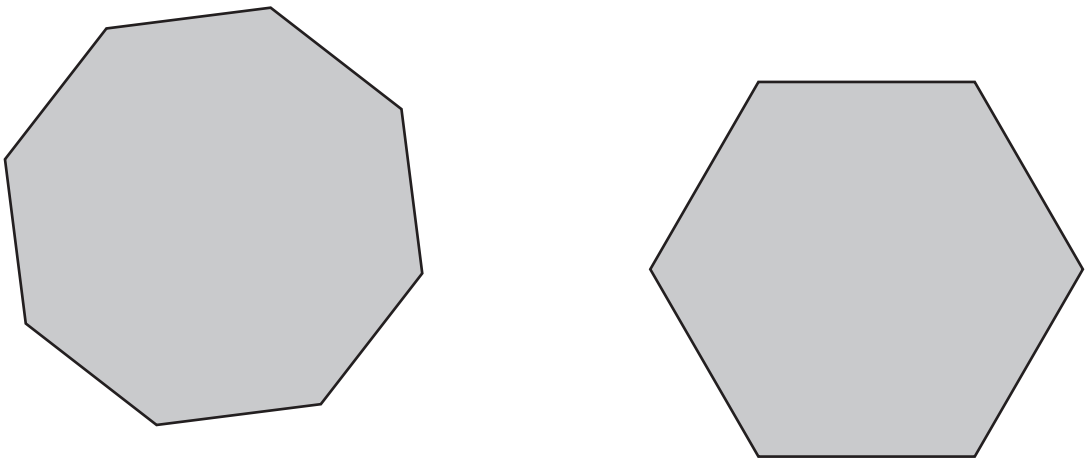
This investigation is about the construction of regular stars and their properties.
Here are some regular stars.



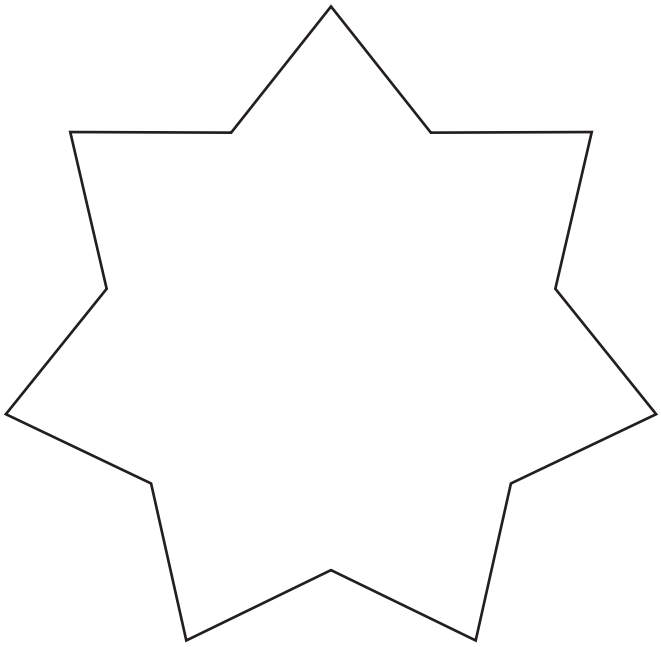
1 You can make regular stars by extending the sides of regular polygons.
For example, this regular polygon makes a regular star with 10 sides and 5 points.



(a) Use a straight edge to draw the regular stars made from these regular polygons.



(b) Draw the starting polygon inside this regular star.



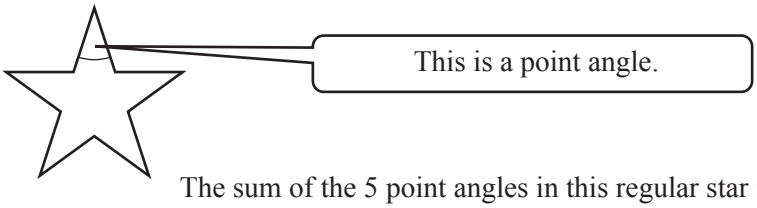
(c) **(i)** Complete this table.

Number of sides (P) of the starting polygon	Number of sides (S) of the star
5	10
6	
7	
8	
9	

(ii) Write down a formula for S in terms of P.

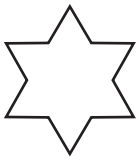
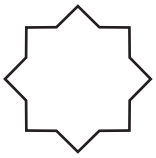
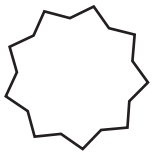
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(d)



The sum of the 5 point angles in this regular star is 180°.

(i) Complete the table.

Regular star	Number of points	Sum of star's point angles
	5	180°
	6	360°
	7	540°
	8	720°
	9	

(ii) Is it possible for a regular star, made from a regular polygon, to have the sum of its point angles equal to 1450°?
Explain how you decide.

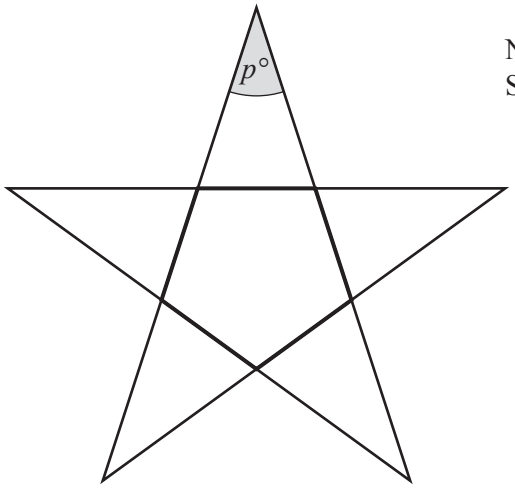
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(e) (i) The regular pentagon making a regular star is shown in bold.

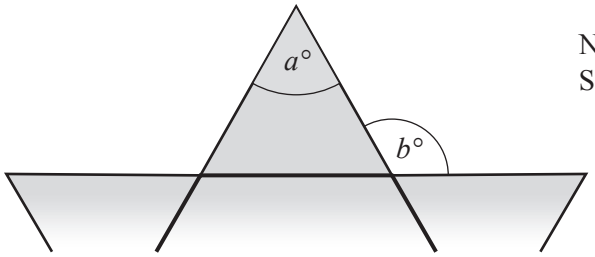
The sum of the interior angles of a pentagon is 540°.
Use this information to calculate the value of p.



NOT TO SCALE

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(ii) This diagram shows part of a different regular star.
It also shows, in bold, part of the regular polygon that makes it.



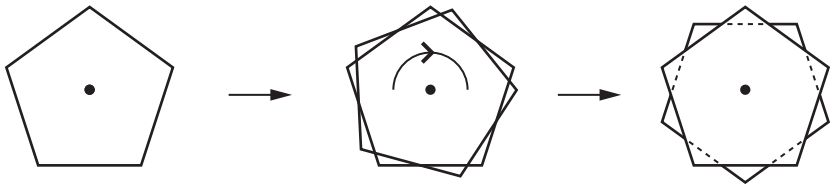
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Find an equation connecting a and b.
Write your answer in its simplest form.

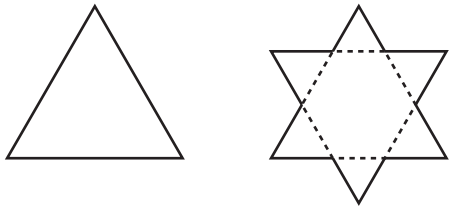
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2 You can also make stars by placing two congruent regular polygons on top of each other and rotating one of the polygons about their common centre.

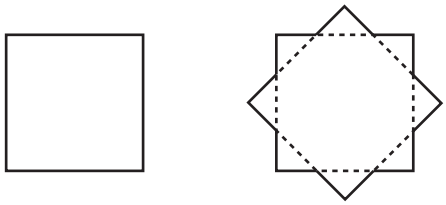
For example



and



and



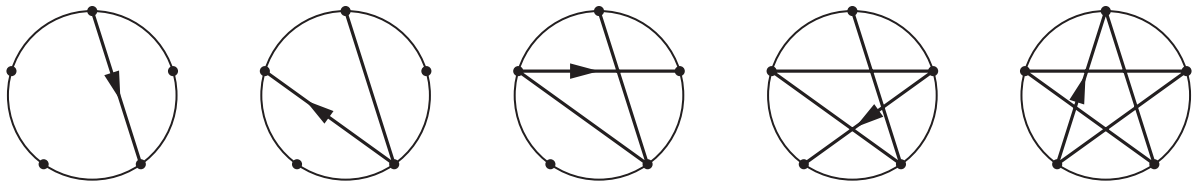
(a) Complete this table.

Number of sides (P) of the starting polygon	Number of points of the star	Number of sides (S) of the star
3		
4		
5	10	20
6		

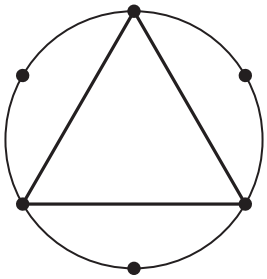
(b) Write down an equation connecting P and S.

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3 You can also make regular stars by joining dots that are equally spaced round a circle.
Here is a star made by joining every second dot round a circle with 5 equally spaced dots.



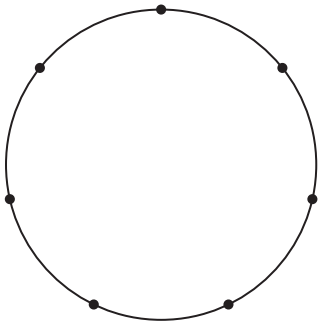
This 3-point star is made by connecting every second dot round a circle with 6 equally spaced dots.



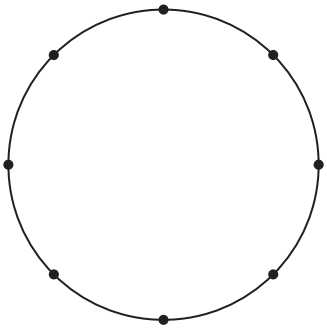
Regular polygons are also regular stars and their vertices are the points of the star.

(a) Draw the stars made by connecting every second dot round these circles.

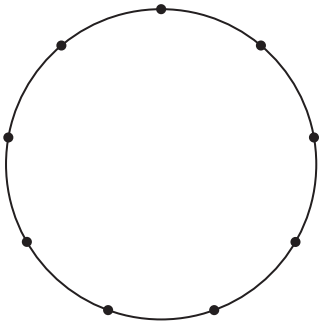
7 dots



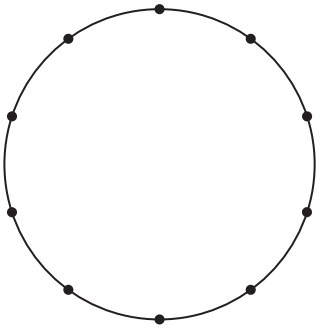
8 dots



9 dots



10 dots



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Complete this table.

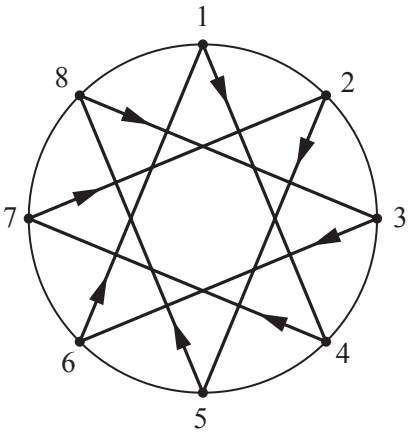
Number of equally spaced dots	Number of points of the star
5	5
6	3
7	
8	
9	
10	
11	
12	

(b) There are 370 equally spaced dots round a circle.
Every second dot is joined.

Find the number of points of the star.

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4 In **question 3** you made stars by joining every second dot round a circle.
You can also make stars by joining every third dot.



Starting from 1, dots are numbered clockwise.

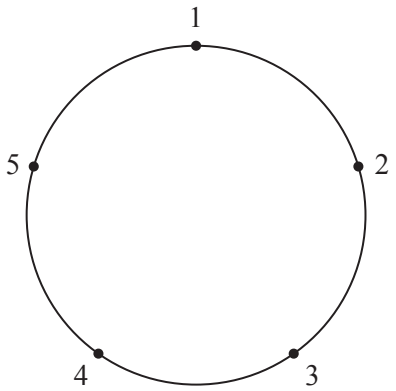
This gives a way to code the star.

1 → 4 → 7 → 2 → 5 → 8 → 3 → 6 → 1

(a) Here is the code for a star.

1 → 4 → 2 → 5 → 3 → 1

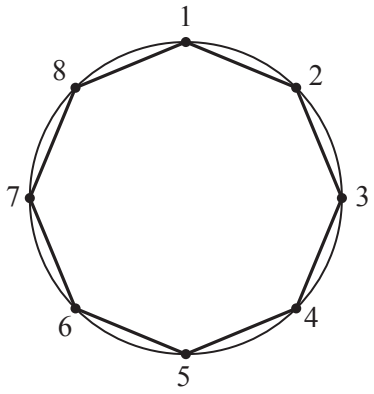
(i) Draw this star on the diagram below.



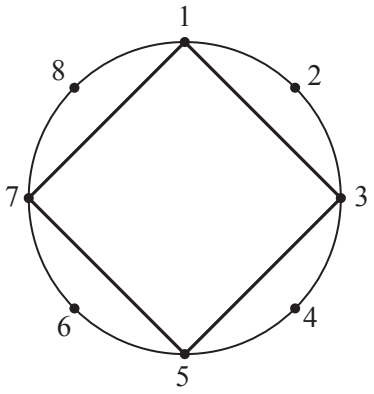
(ii) Write down a different code for the star you have drawn.

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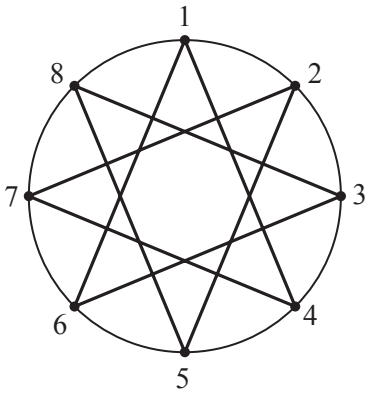
(b) Here are some more stars and their codes.



1 → 2 → 3 → 4 → 5 → 6 → 7 → 8 → 1



1 → 3 → 5 → 7 → 1



1 → 4 → 7 → 2 → 5 → 8 → 3 → 6 → 1

(i) Write down the connection between the code and the number of points of the star.

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(ii) Write down the connection between the code and the number of dots round the circle.

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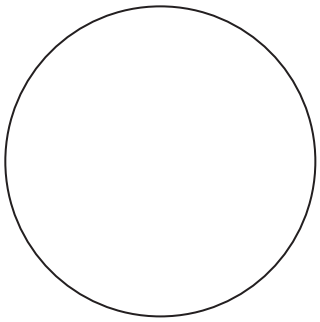
Questions 4(c) and 4(d) are printed on the next page.

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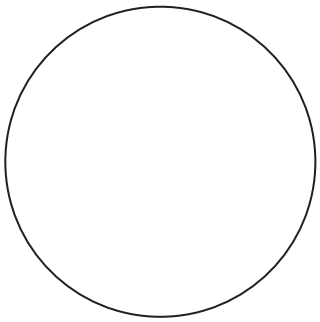
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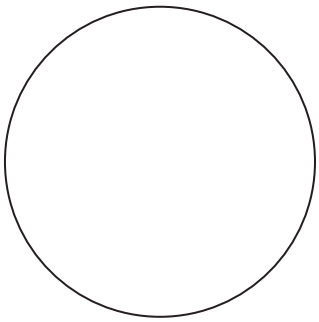
(c) Make a sketch showing the numbered dots and the **regular** star with this code.

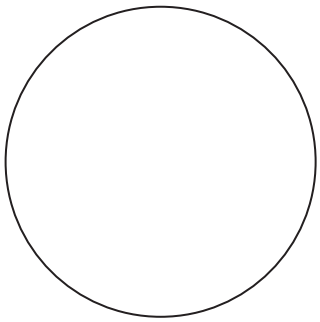
$1 \rightarrow 4 \rightarrow 7 \rightarrow 1$



(d) Find three codes, each starting with 1, which make a star with 10 points.
You may use these circles to help you.







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