A large, solid orange circle is centered on the page, serving as a background for the title text.





Year 6  
**Maths Patterns and  
Sequences**

Activity Booklet

# Ptolemy's Patterns

Ptolemy has created some picture and number patterns for you to solve. Look at each pattern and see if you can spot which will come next in the sequence. The first one has been done for you.





Which code should be placed in the final box?

 P	 R	 P	 ?
S	S	Q	
1	2	3	4

R	P	W	R
Q	S	Q	S
A	B	C	D

The correct answer is A. The two characteristics of Figure 1 is that it is a square and it is black so we know that S = black as it is common to both Figure 1 and 2. In Figure 3, P = square as it is used in Figure 1 too. So Q = white. Therefore, the answer for Figure 4 is A because R = arrow and Q = white.





1. Which is the correct code for figure 4?

 A	 A	 U	 ?
C	Q	C	
1	2	3	4

Q	U	A	U
U	Q	U	A
A	B	C	D

- A
- B
- C
- D





2. Which is the correct code for figure 4?

 Y	 Y	 G	 ?
W	H	W	
1	2	3	4

W	Z	G	H
Y	H	H	G
A	B	C	D

- A
- B
- C
- D





3. Which is the correct code for figure 4?

 D P	 S G	 D G	 ?
1	2	3	4

S	P	D	G
P	S	Q	S
A	B	C	D

- A
- B
- C
- D





4. Which is the correct code for figure 4?

 M B	 R B	 M Q	 ?
1	2	3	4

B	Q	B	R
Y	M	Q	Q
A	B	C	D

- A
- B
- C
- D

5. Which is the correct code for figure 4?

 F D	 F S	 T D	 ?
1	2	3	4

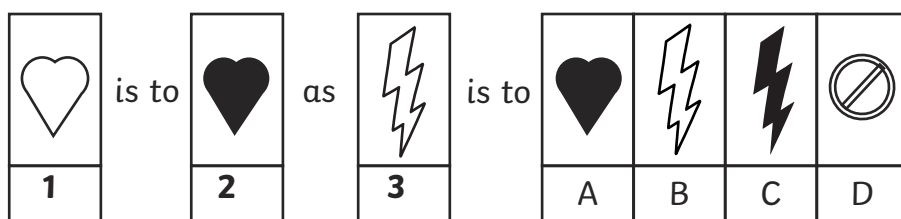
D	T	F	S
F	S	Q	T
A	B	C	D

- A
- B
- C
- D

# Ptolemy's Analogies

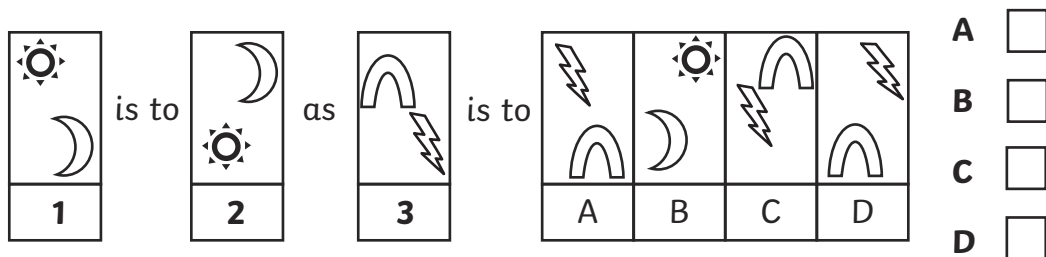
An analogy is when we compare two things to each other based on a relationship they share. So, for example, cold is to hot as old is to young because the relationship is based on the fact that they are opposites. In this Ptolemy challenge, you must work out the analogy between the first two images to help you find an analogy between the third picture and the following four choices. For example:

Which one of the figures in the boxes on the right completes the analogy?

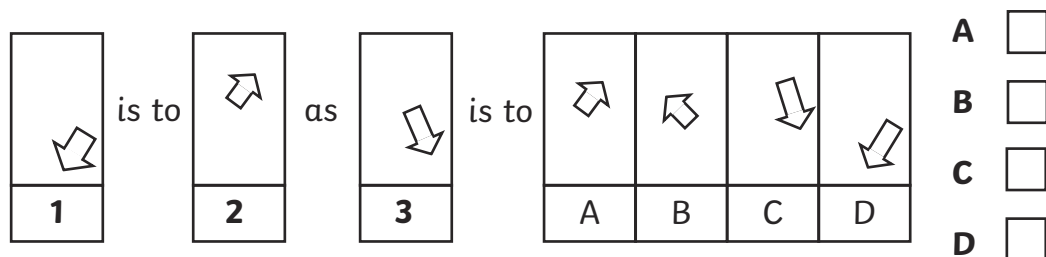


The answer is c. The shape does not change in the example so you are looking for a lightning bolt. The only thing that changes is the colour, therefore the correct answer is c as this has changed colour to black like the first analogy.

1. Which one of the figures in the boxes completes the analogy?



2. Which one of the figures in the boxes completes the analogy?



3. Which one of the figures in the boxes completes the analogy?

♥ ♥ ♥
<b>1</b>

is to

♥ ♥ ♥
<b>2</b>

as

▶ ▶ ▶
<b>3</b>

is to

▶ ▶ ▶
<b>A</b>

▶ ▶ ▶
<b>B</b>

▶ ▶ ▶
<b>C</b>

▶ ▶ ▶
<b>D</b>

**A**

**B**

**C**

**D**

4. Which one of the figures in the boxes completes the analogy?

☉ ⚡ ⚡
<b>1</b>

is to

☉ ⚡ ⚡
<b>2</b>

as

✦ ✦ □
<b>3</b>

is to

✦ ✦ ✦
<b>A</b>

☉ ✦ ✦
<b>B</b>

✦ ✦ ✦
<b>C</b>

✦ ✦ ✦
<b>D</b>

**A**

**B**

**C**

**D**

5. Which one of the figures in the boxes completes the analogy?

▭ ○ ▭
<b>1</b>

is to

▭○▭
<b>2</b>

as

⌒
<b>3</b>

is to

⌒
<b>A</b>

⌒
<b>B</b>

⌒
<b>C</b>

⌒
<b>D</b>

**A**

**B**

**C**

**D**

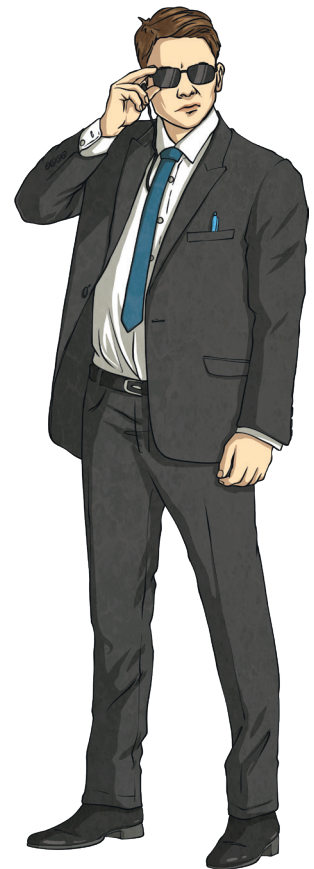
## Secret Sequences

00777 needs your help. He is on a top secret mission and needs to enter the following security sequences into a computer terminal in order to save the world. However, some parts of the sequences are missing. Find the missing numbers in each sequence so that 00777 can enter the codes.

1. \_\_\_\_\_, \_\_\_\_\_, 2, 12, \_\_\_\_\_, 32, \_\_\_\_\_
2. \_\_\_\_\_, \_\_\_\_\_, 316, 326, \_\_\_\_\_, \_\_\_\_\_, 356
3. 1271, 1261, 1251, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_
4. -25, \_\_\_\_\_, \_\_\_\_\_, -55, -65, \_\_\_\_\_
5. \_\_\_\_\_, 7825, 7925, \_\_\_\_\_, \_\_\_\_\_, 8225

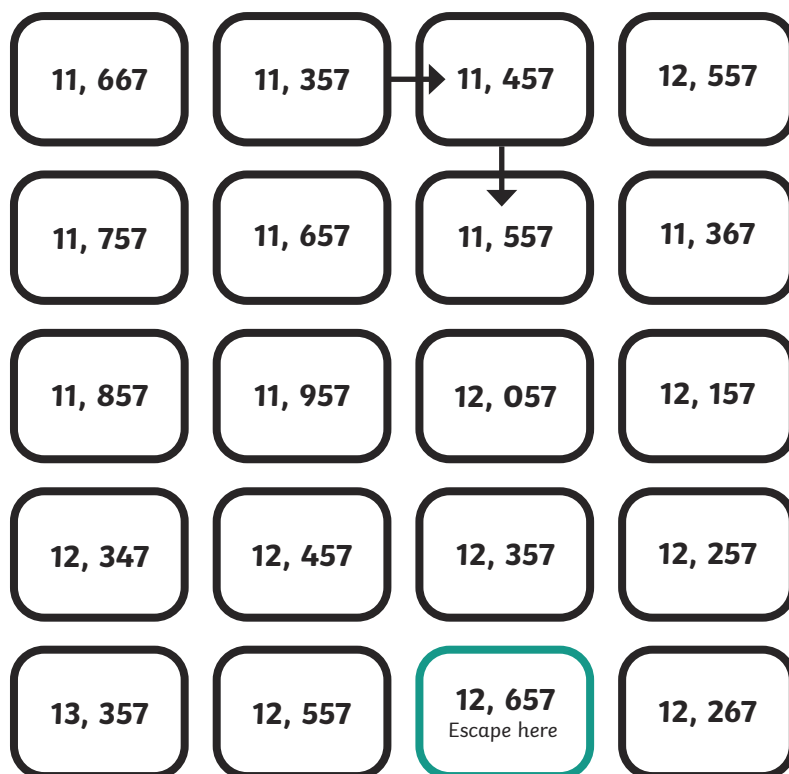
An enemy spy has infiltrated 00777's information and made some mistakes in the following code to try and trick him. **Spot the mistake in each code and correct it.**

1. 7875, 8875, 9875, 11 875, 11 875, 12 875
2. 762 258, 662 258, 652 258, 462 258, 362 258
3. -365, -465, -565, -656, -765
4. 198 236, 208 236, 209 236, 228 236, 238 236



## The Temple of Doom

Try and cross the floor of the temple of doom by stepping on the stones in the correct sequence. Draw a line between the stepping stones to show which one should be stepped on next. The first two steps have been done for you. Keep going until you reach the escape stepping stone. Tip: Calculate the difference between the first two stones to work out the sequence.



## Fibonacci Sequence

Look at this famous number sequence below:

**1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89**

Can you work out the rule for this sequence?

The next number in the sequence is calculated by adding together the two numbers that come before in the sequence.

Spot the rule for each of the sequences below.

**1.**            2,            4,            8,            16,            32,            64,            128,            256

The rule is:

**2.**            5,            8,            11,            14,            17,            20,            23,            26

The rule is:

**3.**            1,            10,            100,            1000,            10 000,            100 000

The rule is:

**4.**            5,            15,            45,            135,            405

The rule is:

## Shape Sequences

John started to make a sequence out of shapes. He is using trapeziums and triangles. He had to stop when he ran out of trapeziums. This is where he got up to.



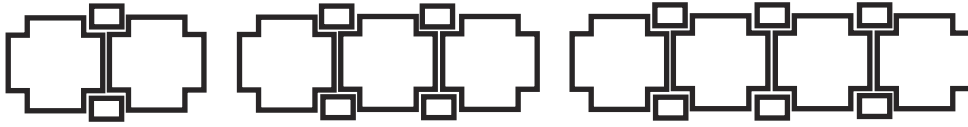
Help John to continue investigating the sequence by completing the table below:

<b>Term (sequence number)</b>	1	2	3	4	5	6	7	8	9
<b>Number of trapeziums</b>	1	2	3						
<b>Number of triangles</b>	0	1	2						
<b>Rule for trapeziums</b>	Number of trapeziums = number of triangles + 1								
<b>Rule for rectangles</b>	Number of triangles = number of trapeziums - 1								

How many triangles are in the 10th term? \_\_\_\_\_

How many triangles are in the 15th term? \_\_\_\_\_

John's friend Neeta also made a sequence using crosses and rectangles. Help Neeta complete the table below.



<b>Term (sequence number)</b>	1	2	3	4	5	6	7	8	9
<b>Number of crosses</b>	2	3	4						
<b>Number of rectangles</b>	2	4	6						
<b>Rule for crosses</b>	Number of crosses = (number of rectangles + 2) ÷ 2								
<b>Rule for triangles</b>	Number of rectangles = (number of crosses × 2) - 2								

How many crosses are in the 10th term? \_\_\_\_\_

How many rectangles are there in the 15th term? \_\_\_\_\_

## Pocket Money Problems

Emma earns £5 a week in pocket money. She is saving her money each week and records her savings on the table below.

Term (week number)	1	2	3	4	5	6	7	8	9
Amount of money saved	£5	£10	£15						

She has only saved for 3 weeks so far. Complete the table to show how much she will have saved after 9 weeks.

To calculate the amount of money she will have saved, multiply the number of weeks by £5. So to find out how much she will have saved by week 8, we would calculate  $8 \times £5$ .

How much money will Emma have saved by week 12? \_\_\_\_\_

How much money will she have saved by week 15? \_\_\_\_\_

Emma wants to buy a new phone. It costs £100. How many weeks will she need to save for?  
\_\_\_\_\_

Imran is saving his pocket money. He wants to buy a new bike which costs £150. He gets £8 a week. He makes a table to calculate how long it will take him to save enough money for the bike.

Term (week number)	1	2	3	4	5	6	7	8	9
Amount of money saved	£8	£16	£24						

Complete Imran's table.

What is the amount of money he has saved in week 14? \_\_\_\_\_

How many weeks will he have to save for until he can afford his bike? \_\_\_\_\_

## Creecher the Cryptologist



**Creecher the Skeleton Cryptologist needs your help.** He needs to find the 10th term in each of these sequences. Can you help him? The first one has been done for you.

1. 5, 8, 11, 14, 17

Find the 10th term: **32**

2. 4, 6, 8, 10, 12

Find the 10th term: \_\_\_\_\_

3. 6, 9, 12, 15, 12

Find the 10th term:

4. 7, 10, 13, 16, 19

Find the 10th term: \_\_\_\_\_

5.

4,

8,

12,

16

Find the 10th term: \_\_\_\_\_

6.

11,

16,

21,

26

Find the 10th term: \_\_\_\_\_

7.

14,

20,





26,

32

Find the 10th term: \_\_\_\_\_

# Ptolemy's Patterns Answers





1.

 A	 A	 U	 ?
C	Q	C	
1	2	3	4

Q	U	A	U
U	Q	U	A
A	B	C	D

- A
- B
- C
- D





2.

 Y	 Y	 G	 ?
W	H	W	
1	2	3	4

W	Z	G	H
Y	H	H	G
A	B	C	D

- A
- B
- C
- D





3.

 D	 S	 D	 ?
P	G	G	
1	2	3	4

S	P	D	G
P	S	Q	S
A	B	C	D

- A
- B
- C
- D





4.

 M	 R	 M	 ?
B	B	Q	
1	2	3	4

B	Q	B	R
Y	M	Q	Q
A	B	C	D

- A
- B
- C
- D

5.

 F	 F	 T	 ?
D	S	D	
1	2	3	4

D	T	F	S
F	S	Q	T
A	B	C	D

- A
- B
- C
- D

# Ptolemy's Analogies Answers

1.



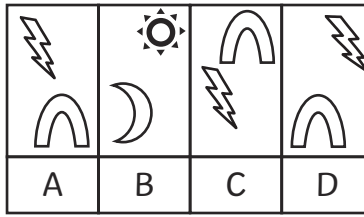
is to



as



is to



- A
- B
- C
- D

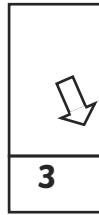
2.



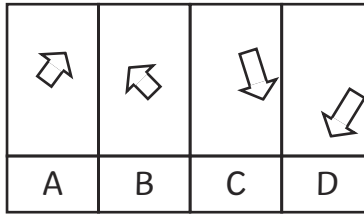
is to



as



is to



- A
- B
- C
- D

3.



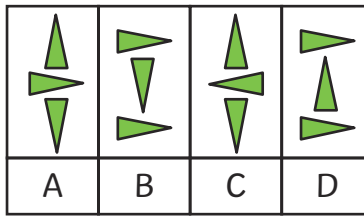
is to



as



is to



- A
- B
- C
- D

4.



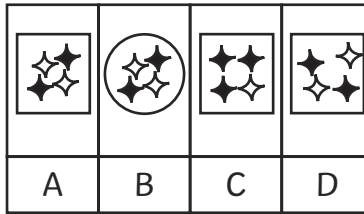
is to



as

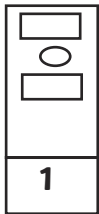


is to



- A
- B
- C
- D

5.



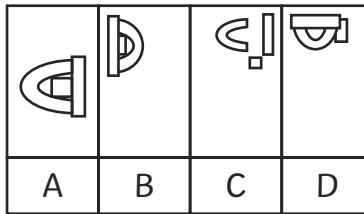
is to



as



is to



- A
- B
- C
- D

## Secret Sequences Answers

1. -18, -8, 2, 12, **22**, 32, 42

2. **296**, **306**, 316, 326, **336**, **346**, 356

3. 1271, 1261, 1251, **1241**, **1231**, **1221**

4. -25, **-35**, **-45**, -55, -65, **-75**

5. **7725**, 7825, 7925, **8025**, **8125**, 8225

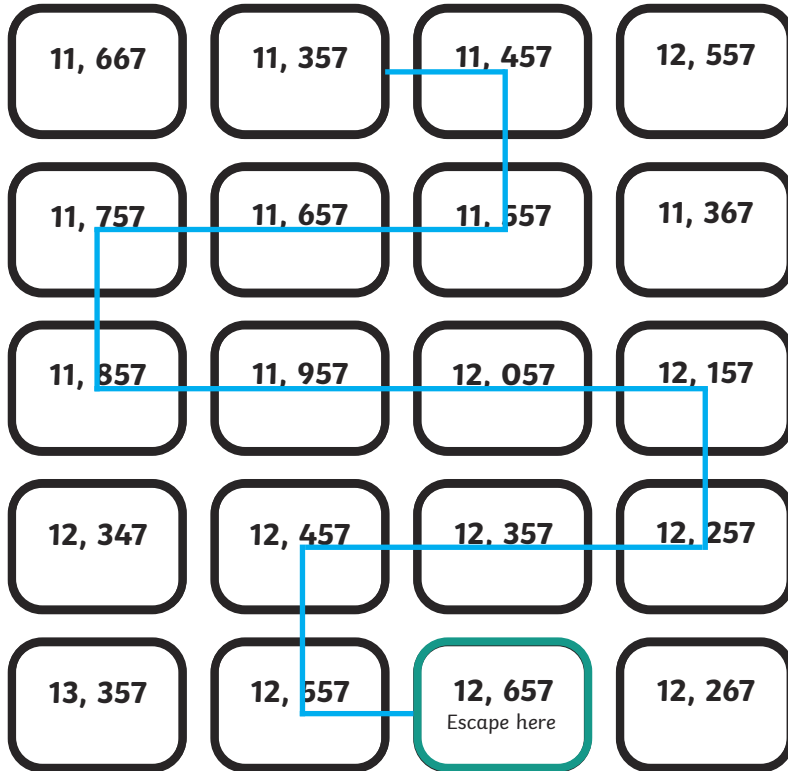
1. 7875, 8875, 9875, ~~11 875~~, 11 875, 12 875  
**10 875**

2. 762 258, 662 258, ~~652 258~~, 462 258, 362 258  
**562 258**

3. -365, -465, -565, ~~-656~~, -765  
**-665**

4. 198 236, 208 236, ~~209 236~~, 228 236, 238 236  
**218 236**

# The Temple of Doom Answers



## Fibonacci Sequence Answers

1. 2, 4, 8, 16, 32, 64, 128, 256

The rule is: **Double the number or multiple by 2**

2. 5, 8, 11, 14, 17, 20, 23, 26

The rule is: **add 3**

3. 1, 10, 100, 1000, 10 000, 100 000

The rule is: **multiply by 10**

4. 5, 15, 45, 135, 405

The rule is: **multiply by 3**

## Shape Sequences Answers

Help John to continue investigating the sequence by completing the table below:

<b>Term (sequence number)</b>	1	2	3	4	5	6	7	8	9
<b>Number of trapeziums</b>	1	2	3	4	5	6	7	8	9
<b>Number of triangles</b>	0	1	2	3	4	5	6	7	8
<b>Rule for trapeziums</b>	Number of trapeziums = number of triangles + 1								
<b>Rule for triangles</b>	Number of triangles = number of trapeziums - 1								

How many triangles are in the 10th term? **9**

How many triangles are in the 15th term? **14**

John's friend Neeta also made a sequence using crosses and rectangles. Help Neeta complete the table below.

<b>Term (sequence number)</b>	1	2	3	4	5	6	7	8	9
<b>Number of crosses</b>	2	3	4	5	6	7	8	9	10
<b>Number of rectangles</b>	2	4	6	8	10	12	14	16	18
<b>Rule for crosses</b>	Number of crosses = (number of rectangles + 2) ÷ 2								
<b>Rule for rectangles</b>	Number of rectangles = (number of crosses × 2) - 2								

How many crosses are in the 10th term? **11**

How many rectangles are there in the 15th term? **30**

## Pocket Money Problems

Emma earns £5 a week in pocket money. She is saving her money each week and records her savings on the table below.

<b>Term (week number)</b>	1	2	3	4	5	6	7	8	9
<b>Amount of money saved</b>	£5	£10	£15	<b>£20</b>	<b>£25</b>	<b>£30</b>	<b>£35</b>	<b>£40</b>	<b>£45</b>

She has only saved for 3 weeks so far. Complete the table to show how much she will have saved after 9 weeks.

To calculate the amount of money she will have saved, multiply the number of weeks by £5. So to find out how much she will have saved by week 8, we would calculate  $8 \times £5$ .

How much money will Emma have saved by week 12?

**£60**

How much money will she have saved by week 15?

**£75**

Emma wants to buy a new phone. It costs £100. How many weeks will she need to save for?

**20 weeks**

Imran is saving his pocket money. He wants to buy a new bike which costs £150. He gets £8 a week. He makes a table to calculate how long it will take him to save enough money for the bike.

<b>Term (week number)</b>	1	2	3	4	5	6	7	8	9
<b>Amount of money saved</b>	£8	£16	£24	<b>£32</b>	<b>£40</b>	<b>£48</b>	<b>£56</b>	<b>£64</b>	<b>£72</b>

Complete Imran's table.

What is the amount of money he has saved in week 14?

**£112**

How many weeks will he have to save for until he can afford his bike?

**19 weeks**

## Creecher the Cryptologist

2. 4, 6, 8, 10, 12

Find the 10th term: **22**

3. 6 9 12 15 18

Find the 10th term: **33**

4. 7, 10, 13, 16, 19

Find the 10th term: **34**

5. 4, 8, 12, 16

Find the 10th term: **36**

6. 11, 16, 21, 26

Find the 10th term: **56**

7. 14, 20, 26, 32

Find the 10th term: **68**