

SIGMABUDGIE · GRADE 3

# Patterns & Reasoning

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A gentle walkthrough & a 24-question exam

Part 1 walks through patterns, missing numbers, and reasoning from the very beginning, with drawings. Part 2 is a 24-question exam that starts easy and slowly builds to harder, ISEE-style reasoning questions. Work through the lesson together first, then let your child try the exam. The answer key at the back explains every question.

## 1 · Repeating patterns

A repeating pattern has a **core** that happens again and again. Circle, square, circle, square... the core is "circle, square."

Find the core, then keep going. After circle, square, triangle, circle, square, triangle comes... **circle**.



core: circle, square. Next: circle

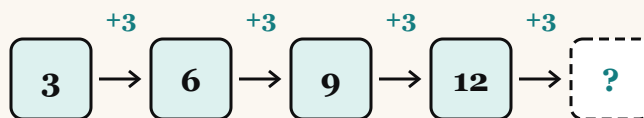


core: circle, square, triangle. Next: circle

## 2 · Number patterns that add

3, 6, 9, 12... Each number is **3 more** than the one before. The **rule** is "add 3." To find the rule, subtract neighbors:  $6 - 3 = 3$ ,  $9 - 6 = 3$ .

Next comes  $12 + 3 = 15$ .

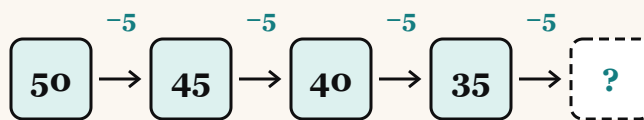


rule: add 3. Next: 15

## 3 · Patterns that count back

Patterns can shrink too. 50, 45, 40, 35... the rule is **subtract 5**. Next: **30**.

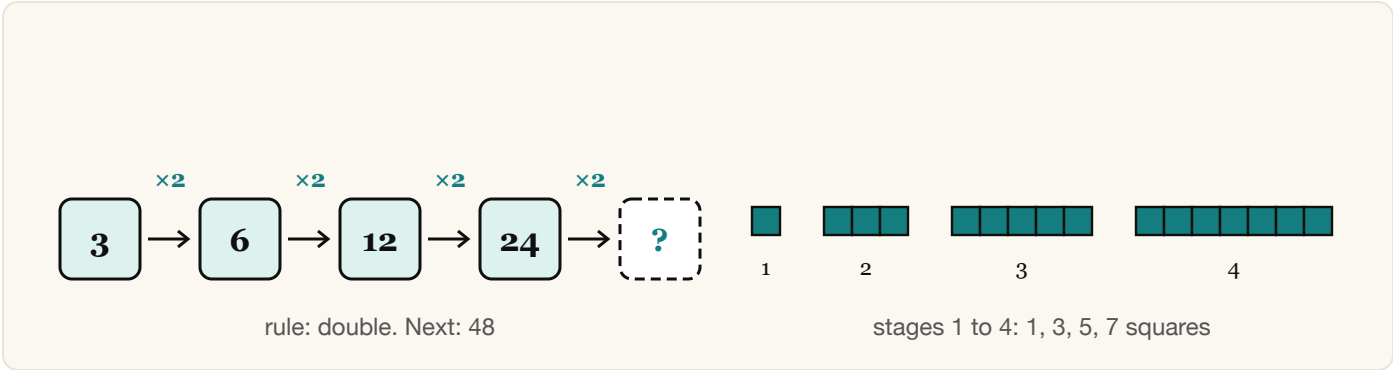
If the numbers get smaller, the rule subtracts (or divides).



rule: subtract 5. Next: 30

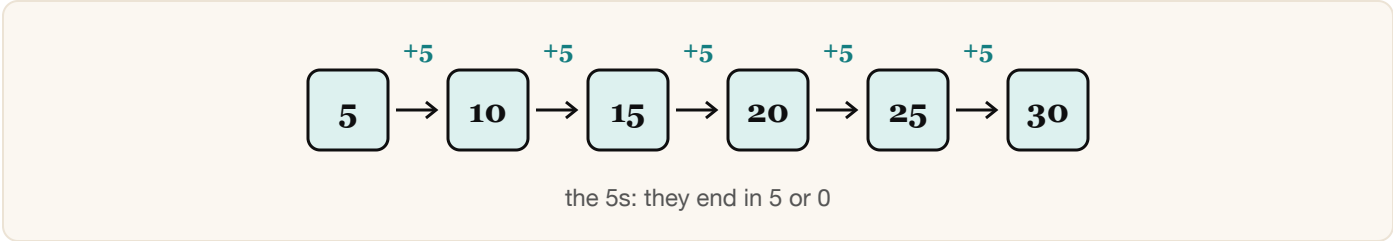
## 4 · Growing patterns

Some patterns grow faster and faster. 3, 6, 12, 24: each number is **double** the last. Next: **48**.  
A picture pattern can grow too. These rows go 1, 3, 5: two more squares each time. Stage 4 has 7.



## 5 · Patterns in the times tables

Multiples of **5** always end in 0 or 5. Multiples of **10** end in 0. Multiples of **2** are the even numbers (they end in 0, 2, 4, 6, or 8).  
So 35 is a multiple of 5, and 48 is even. Spotting these saves time on a test.



## 6 · In and out: find the rule

A rule machine changes every number the same way. In 2 → Out 6. In 5 → Out 15. In 8 → Out 24. What is the rule? Each Out is the In **times 3**.  
So In 10 → Out **30**. Test your rule on every row before you trust it.

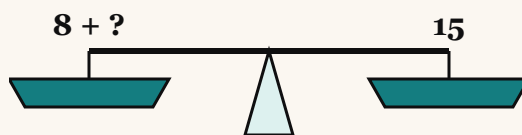
| In | Out |
|----|-----|
| 2  | 6   |
| 5  | 15  |
| 8  | 24  |
| 10 | ?   |

rule:  $\times 3$ , so  $10 \rightarrow 30$

## 7 • Missing numbers in equations

An equation is a balance: both sides weigh the same.  $8 + \square = 15$ . What goes with 8 to make 15? Think  $15 - 8 = 7$ .

$\square - 6 = 9$ : the number was 9 before taking 6 away, so add back:  $9 + 6 = 15$ .  $4 \times \square = 24$ :  $24 \div 4 = 6$ .



$$8 + ? = 15, \text{ so } ? = 7$$

## 8 • Working backwards

"I think of a number, add 5, and get 12. What was my number?" Go **backwards** and do the **opposite**:  $12 - 5 = 7$ .

"I double a number, then subtract 4, and get 10." Backwards:  $10 + 4 = 14$ , then  $14 \div 2 = 7$ .



forwards:  $? + 5 = 12$

backwards:  $12 - 5 = 7$

## 9 • Two-step problems

"Leo has 3 boxes of 8 crayons. He gives away 5. How many are left?" Two steps: first  $3 \times 8 = 24$ , then  $24 - 5 = 19$ .

Write the first answer down before you start the second step.

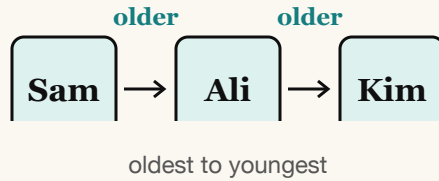


step 1:  $3 \times 8 = 24$ . Step 2:  $24 - 5 = 19$

## 10 • Which must be true?

"Sam is older than Ali. Ali is older than Kim." Line them up: Sam, Ali, Kim. So Sam is older than Kim: that **must** be true.

"Kim is 6 years old" might be true, but the clues do not say so. On a test, pick only what the clues **force**.



## 11 • Guess and check with a table

"Two numbers add to 10 and multiply to 21." Try pairs that add to 10 and check the product: 1 and 9  $\rightarrow$  9. 2 and 8  $\rightarrow$  16. 3 and 7  $\rightarrow$  **21**. Found it.

A table keeps your guesses tidy so you do not repeat one.

| pair  | product |
|-------|---------|
| 1 + 9 | 9       |
| 2 + 8 | 16      |
| 3 + 7 | 21 ✓    |

guess, check, adjust

## 12 • Read like a detective

Some problems hide **extra** information. "Mia has 4 red pens, 3 blue pens, and 2 notebooks. How many pens?" The notebooks are a distraction:  $4 + 3 = 7$ .

Watch the words: "**fewer**" means subtract, "**each**" often means multiply, "**altogether**" means add. You are ready for the test! 🎉

Read each drawing first, then choose the best answer. Take your time, there is no clock here. Questions start gentle and get harder toward the end. Circle your answer.

- 1 Which shape comes next in the pattern?



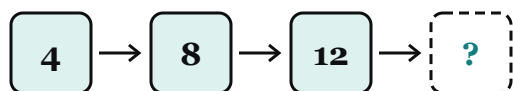
A square

B triangle

C star

D circle

- 2 What number comes next?



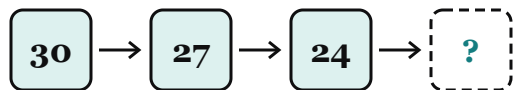
A 16

B 14

C 13

D 20

- 3 What number comes next?



A 22

B 20

C 21

D 27

- 4 What is the rule for the pattern 5, 10, 15, 20?

A add 10

B add 5

C double

D subtract 5

- 5  $7 + \square = 15$ . What is the missing number?

A 22

B 7

C 9

D 8

6 Which shape comes next in the pattern?



A square

B circle

C triangle

D star

7 What number comes next?



A 18

B 32

C 24

D 20

8 What is the rule for this table, and what is the missing Out?

| In | Out |
|----|-----|
| 1  | 4   |
| 3  | 12  |
| 5  | 20  |
| 7  | ?   |

A + 3, so 10

B × 3, so 21

C × 4, so 28

D + 9, so 16

9  $\square - 9 = 6$ . What is the missing number?

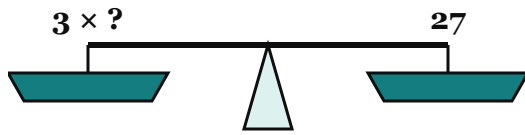
A 15

B 3

C 13

D 16

- 10  $3 \times \square = 27$ . What is the missing number?



- A 8  
B 24  
C 7  
D 9

- 11 The pattern grows by the same amount each stage. How many squares will stage 4 have?



- A 6  
B 8  
C 7  
D 10

- 12 I think of a number. I double it and get 18. What is my number?

- A 36  
B 9  
C 16  
D 8

- 13 Which number is a multiple of 5?

- A 35  
B 52  
C 23  
D 14

- 14 Nia buys 4 packs of stickers with 6 stickers in each pack. She gives 7 stickers to a friend. How many stickers does she have left?

- A 24  
B 31  
C 3  
D 17

- 15 Sam is older than Ali. Ali is older than Kim. Which statement MUST be true?

- A Kim is older than Sam.  
B Sam is older than Kim.  
C Ali is the oldest.  
D Kim is 6 years old.

16 Two numbers add to 10 and multiply to 21. What are the numbers?

A 2 and 8

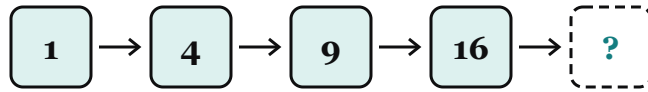
B 4 and 6

C 3 and 7

D 1 and 9

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17 What number comes next?



A 20

B 24

C 32

D 25

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18 A pattern starts 5, 10, 15, 20... What is the 8th number?

A 35

B 40

C 45

D 8

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19 The rule is "subtract 3, then double." Start with 7. What comes out?



A 8

B 11

C 4

D 20

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20 Mia has 4 red pens, 3 blue pens, and 2 notebooks. How many pens does she have?

A 9

B 5

C 7

D 6

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## ANSWER KEY & EXPLANATIONS

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- 1 D** The core is circle, square. After a square comes a circle.
- 
- 2 A** The rule is add 4:  $12 + 4 = 16$ .
- 
- 3 C** The numbers go down by 3:  $24 - 3 = 21$ .
- 
- 4 B** Each number is 5 more than the one before.
- 
- 5 D**  $15 - 7 = 8$ , and  $7 + 8 = 15$ .
- 
- 6 A** The core is circle, square, triangle. After a circle comes a square.
- 
- 7 B** Each number is double the last:  $16 \times 2 = 32$ .
- 
- 8 C**  $1 \rightarrow 4$ ,  $3 \rightarrow 12$ ,  $5 \rightarrow 20$ : every Out is the In times 4.  $7 \times 4 = 28$ .
- 
- 9 A** Add back:  $6 + 9 = 15$ . Check:  $15 - 9 = 6$ .
- 
- 10 D**  $27 \div 3 = 9$ , and  $3 \times 9 = 27$ .
- 
- 11 C** 1, 3, 5: two more each time.  $5 + 2 = 7$ .
- 
- 12 B** Work backwards:  $18 \div 2 = 9$ .
- 
- 13 A** Multiples of 5 end in 0 or 5. Only 35 does.
- 
- 14 D** Step 1:  $4 \times 6 = 24$ . Step 2:  $24 - 7 = 17$ .
- 
- 15 B** Oldest to youngest: Sam, Ali, Kim. So Sam is older than Kim. The clues say nothing about exact ages.
- 
- 16 C**  $3 + 7 = 10$  and  $3 \times 7 = 21$ . The other pairs multiply to 16, 24, and 9.
- 
- 17 D** The gaps grow: +3, +5, +7, so next is +9:  $16 + 9 = 25$ . (They are also  $1 \times 1$ ,  $2 \times 2$ ,  $3 \times 3$ ,  $4 \times 4$ ,  $5 \times 5$ .)
- 
- 18 B** The nth number is  $5 \times n$ . The 8th is  $5 \times 8 = 40$ .
- 
- 19 A**  $7 - 3 = 4$ , then  $4 \times 2 = 8$ .
- 
- 20 C** Only the pens count:  $4 + 3 = 7$ . The notebooks are extra information.
- 
- 21 C**  $8 \times 3 = 24$ , then  $24 + 1 = 25$ . Check the rule:  $3 \times 3 + 1 = 10$  and  $5 \times 3 + 1 = 16$ .
- 
- 22 A** Backwards:  $10 + 4 = 14$ , then  $14 \div 2 = 7$ .
- 
- 23 D** The core has 3 shapes: positions 1, 4, 7, 10 are all circles.
- 
- 24 B** Ava has the fish. Ben does not have the dog, so Ben has the cat. That leaves the dog for Leo.
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