# Year 3 maths: Number machines (Hard)

Maths · Patterns and algebra
Level: Hard

Student: _____ Date: _____

**Instructions**
- There are 10 questions. Read each one carefully.
- Write your answers on this paper. Use the space under a question to work it out.
- A grown-up can read a question aloud — that's fine.
- The answers are at the end. Check them together when you have finished.

## Questions

**1.** Mei's machine: START → + 8 → × 4 → 60. What number did Mei start with?

Circle one answer.

○ **A** 52 ○ **B** 7 ○ **C** 15 ○ **D** 13 ○ **E** 68

**2.** START → × 3 → + 5 → × 2 → 46. What is the start number? Answer: ☐

Working:

**3.** A machine doubles a number, then takes away 1. Callum makes three claims. 1 If 10 goes in, 19 comes out. 2 If 4 goes in, 6 comes out. 3 If 15 comes out, 8 went in. Which claims are correct?

Circle one answer.

○ **A** claim 1 only
○ **B** claim 3 only
○ **C** claims 1 and 2 only
○ **D** claims 1 and 3 only
○ **E** claims 1, 2 and 3

**4.** A machine takes away 4, then doubles. Ali gets 18 out. What number did he put in?

Circle one answer.

○ **A** 9 ○ **B** 11 ○ **C** 13 ○ **D** 5 ○ **E** 28

**5.** Dad buys 2 dozen bread rolls for a barbecue. The family eats half a dozen. How many rolls are left?

Answer: ☐

Working:

**6.** Matilda thinks of a number. She adds 9, then takes away 4, then adds 12. She ends up with 30. What number did she start with?

Circle one answer.

○ **A** 47 ○ **B** 13 ○ **C** 18 ○ **D** 22 ○ **E** 5

**7.** Ava finds the sum of 2 and 7 and multiplies it by itself. Liam finds the sum of 2 and 7 and then doubles it. How much bigger is Ava's number than Liam's?

Circle one answer.

○ **A** 53 ○ **B** 18 ○ **C** 63 ○ **D** 72 ○ **E** 81

**8.** What number must go in the box to make this number sentence true? $3 \times \square + 12 = 5 \times 9$

Circle one answer.

○ **A** 33 ○ **B** 11 ○ **C** 12 ○ **D** 19 ○ **E** 3

**9.** Each number in the top row goes through the same rule to make the number below it. What number replaces the ?

Circle one answer.

| **In** | 6 | 2 | 9 | 4 | 7 |
|---|---|---|---|---|---|
| **Out** | 17 | 1 | 29 | ? | 21 |

○ **A** 16 ○ **B** 11 ○ **C** 9 ○ **D** 25 ○ **E** 15

**10.** A library gets a box of 60 new books. It puts 9 on the display table and 6 books on each of 7 shelves. Which number sentence can be used to find how many books are still in the box?

Circle one answer.

○ **A** $60 - 9 - (7 \times 6)$ ○ **B** $60 - (7 \times 6)$ ○ **C** $60 - (9 \times 7) - 6$

○ **D** $60 - 9 - 7 - 6$ ○ **E** $(7 \times 6) + 9 - 60$

# Answer key

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**1.** B — 7

Undo × 4 first: 60 ÷ 4 = 15. Then undo + 8: 15 − 8 = 7. Check: 7 + 8 = 15, 15 × 4 = 60.

**2.** 6

Undo × 2: 46 ÷ 2 = 23. Undo + 5: 23 − 5 = 18. Undo × 3: 18 ÷ 3 = 6. Check: 6 × 3 = 18, 18 + 5 = 23, 23 × 2 = 46.

**3.** D — claims 1 and 3 only

Claim 1: 10 × 2 = 20, 20 − 1 = 19. True. Claim 2: 4 × 2 = 8, 8 − 1 = 7, not 6 (6 comes from taking away first). False. Claim 3: 8 × 2 = 16, 16 − 1 = 15. True.

**4.** C — 13

Undo doubling first: 18 ÷ 2 = 9. Undo − 4: 9 + 4 = 13. Check: 13 − 4 = 9, 9 × 2 = 18.

**5.** 18

2 dozen is 24. Half a dozen is 6. 24 − 6 = 18.

**6.** B — 13

Work backwards from 30. Undo + 12: 30 − 12 = 18. Undo − 4: 18 + 4 = 22. Undo + 9: 22 − 9 = 13. Check: 13 + 9 = 22, 22 − 4 = 18, 18 + 12 = 30.

**7.** C — 63

The sum is 2 + 7 = 9. Ava: 9 × 9 = 81. Liam: 9 × 2 = 18. 81 − 18 = 63.

**8.** B — 11

The right side is 5 × 9 = 45. Undo + 12: 45 − 12 = 33. Undo × 3: 33 ÷ 3 = 11. Check: 3 × 11 + 12 = 45.

**9.** C — 9

The rule is × 4, then take away 7: 6 → 17, 2 → 1, 9 → 29, 7 → 21. So 4 × 4 − 7 = 9.

**10.** A — 60 − 9 − (7 × 6)

Start with 60. Take away the 9 on display. 7 shelves of 6 is 7 × 6 = 42. 60 − 9 − (7 × 6) = 60 − 9 − 42 = 9 left.