

Who Stays and Who Sleeps?

Level 3 — Autumn puzzles for grades 5–8

Page 1 — Crack the animal codes

Every picture hides a whole number. Remember the order of operations: $\times$ and $\div$ before $+$ and $-$, and brackets first. Find the numbers, then read the name of an animal!

Puzzle 1 — This small mountain animal stays active all winter

$$\star \times \star + \star = 12$$

$$\text{acorn} = \star \times 2 - 1$$

$$\text{pear} = \text{acorn} \times 2 - \star + 1$$

$$\text{pumpkin} = (\text{pear} - \text{acorn}) \times \star + \star$$

Write the number for each picture:



A

= _____



P

= _____



K

= _____



I

= _____

Put the letters in order from the smallest number to the biggest. Which animal is it?

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Puzzle 2 — This striped animal hibernates

$$\text{Apple} + \text{Apple} = 2$$

$$\text{Mushroom} = \text{Apple} + \text{Apple}$$

$$\text{Acorn} = \text{Mushroom} \times \text{Mushroom}$$

$$\text{Star} = \text{Acorn} + \text{Mushroom}$$

$$\text{Pear} = \text{Acorn} \times \text{Mushroom} + \text{Apple}$$

$$\text{Sunflower} = \text{Pear} + \text{Acorn} - \text{Apple}$$

$$\text{Pumpkin} = \text{Pear} \times \text{Mushroom} - \text{Star} \div \text{Mushroom}$$

$$\text{Blueberries} = (\text{Pumpkin} - \text{Star}) \times \text{Mushroom} + \text{Mushroom}$$

Write the number for each picture:



N

P

C

K

M

H

U

I

= _____ = _____ = _____ = _____ = _____ = _____ = _____ = _____

Put the letters in order from the smallest number to the biggest. Which animal is it?

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Page 3 — The pika builds haypiles

A pika lives high in the mountains and does not hibernate. All summer it cuts grass and flowers and dries them into haypiles for the winter. One pika made four haypiles: A, B, C and D. Their masses are 18 kg, 24 kg, 30 kg and 45 kg — but which is which?

1. The mass of pile A is divisible by 9.
2. Pile B has an odd mass.
3. Pile C is the heaviest of the piles with an even mass.
4. Piles A and D together have a mass of 42 kg.

Find the mass of each pile. Fill in the table and explain your reasoning.

Haypile	A	B	C	D
Mass (kg)				

Explain: in which order did you use the clues, and why?

a) What is the total mass of hay? _____ kg

b) A pika eats about 150 g of hay a day. How many days does pile B last? _____ days

c) Winter in the mountains lasts about 210 days. Is there enough hay for the whole winter? How many kilograms are left over, or missing?

d) One of the four clues is not needed. Which one, and why? _____

Did you know?

A pika is a relative of the rabbit, about the size of a hamster (150–200 g), and lives in rocky mountain slopes. It never hibernates. In summer it makes hundreds of trips a day carrying mouthfuls of grass and flowers to its haypile, and it even turns the hay so it dries properly. Some plants it collects are poisonous when fresh but become safe to eat after a few weeks of drying — the pika eats those last. A real haypile weighs a few kilograms up to about 25 kg; the numbers in this puzzle are bigger to make the arithmetic interesting.

Page 4 — The chipmunk loses weight

Part A. Before hibernation a chipmunk weighs 120 g. In the first week of hibernation it loses 10 g. Each week after that it loses 2 g less than the week before (10 g, then 8 g, then 6 g, ...).

Week	0	1	2	3	4	5	6
Loss that week (g)	—	10	8				
Mass (g)	120	110					

- a) How much does the chipmunk weigh after 4 weeks? _____ g
- b) In which week does the weight loss stop? What is the mass then? week _____, _____ g
- c) What is the total loss, as a percentage of the starting mass? _____ %
- d) Write the loss in week n as a formula: loss = _____ (check: $n = 1$ gives 10)

Part B. Two chipmunks go to sleep on the same day. Chip weighs 120 g and loses 6 g every week. Dale weighs 96 g and loses 3 g every week.

Week	0	1	2	3	4	5	6	7	8
Chip (g)	120								
Dale (g)	96								

- e) After how many weeks do they weigh the same? _____ weeks. What is the mass then? _____ g
- f) Write the mass of each chipmunk after w weeks: Chip = _____ Dale = _____
- g) Solve it with algebra: set the two expressions equal and find w .

Did you know?

A chipmunk hibernates differently from a bear. It does not get fat in autumn — instead it stores up to 8 litres of seeds and nuts in its burrow and sleeps on top of them. Every few days it wakes up, its body temperature climbs from about 5 °C back to 37 °C, it eats a snack from its store, and then it cools down and sleeps again. Its cheek pouches can stretch to hold about 30 sunflower seeds at once. The weight-loss numbers on this page are a mathematical model, not measurements — a real chipmunk loses much less than a bear.

Answer Key (for the teacher)

Level 3

Puzzle 1: leaf $\times$ leaf + leaf = 12 $\rightarrow$ leaf P = 3. acorn I = $3 \times 2 - 1 = 5$. pear K = $5 \times 2 - 3 + 1 = 8$.

pumpkin A = $(8 - 5) \times 3 + 3 = 12 \rightarrow$ PIKA (pikas store hay and stay active under the snow).

Puzzle 2: apple C = 1, mushroom H = 2, acorn I = 4, leaf P = 6, pear M = $4 \times 2 + 1 = 9$, sunflower U = $9 + 4 - 1 = 12$, pumpkin N = $9 \times 2 - 6 \div 2 = 18 - 3 = 15$, berry K = $(15 - 6) \times 2 + 2 = 20 \rightarrow$ CHIPMUNK.

Page 3: Clue 1: A is 18 or 45. Clue 2: B is odd $\rightarrow$ B = 45, so A = 18. Clue 4: A + D = 42 $\rightarrow$ D = 24. That leaves C = 30. a) 117 kg b) $45\,000 \div 150 = 300$ days c) $210 \times 150\text{ g} = 31.5\text{ kg}$ needed, $117 - 31.5 = 85.5\text{ kg}$ left over d) clue 3 is not needed — once A, B and D are known, C is what is left.

Page 4, Part A: losses 10, 8, 6, 4, 2, 0; masses 120, 110, 102, 96, 92, 90, 90. a) 92 g b) week 6 (loss 0), 90 g c) $30 \div 120 = 25\%$ d) loss = $12 - 2n$.

Part B: Chip 120, 114, 108, 102, 96, 90, 84, 78, 72; Dale 96, 93, 90, 87, 84, 81, 78, 75, 72. e) 8 weeks, 72 g f) Chip = $120 - 6w$, Dale = $96 - 3w$ g) $120 - 6w = 96 - 3w \rightarrow 24 = 3w \rightarrow w = 8$.