LESSON MAKER PRO

Difference Detectives

Find the pattern behind changing rates.

HIGH SCHOOL · MT.CORE.ALG.QUAD.1

MT.CORE.ALG.QUAD.1 "Understand that quadratic functions do not have a constant rate of change but have a constant second difference over equal intervals and identify the constant second difference in tables."

NAME _____ DATE _____

SECOND DIFFERENCES

When x-values increase by equal amounts, subtract consecutive y-values to find the first differences. Then subtract consecutive first differences. A quadratic pattern has a constant second difference, even though its first differences change.

WORKED EXAMPLE

Find the constant second difference.

x	y
12	100
13	107
14	118
15	133

1. First differences: 7, 11, 15.
2. Second differences: 11 - 7 = 4 and 15 - 11 = 4.

Answer: The constant second difference is 4.

PRACTICE 4 problems

1 Find the constant second difference: (0, 2), (1, 5), (2, 10), (3, 17).

ANSWER _____

2 Find the constant second difference: (0, 18), (1, 17), (2, 12), (3, 3).

ANSWER _____

3 Find the first differences and the constant second difference: (0, 1), (2, 9), (4, 25), (6, 49).

ANSWER _____

4 Find the constant second difference: (-2, 19), (-1, 8), (0, 7), (1, 16).

ANSWER _____

APPLY IT Show your work

1 A basketball's height is recorded every second. Find the constant second difference in feet.

BASKETBALL SHOT

Time (seconds)	Height (feet)
0	3
1	9
2	11
3	9

ANSWER _____

2 A student tracks savings for a concert. Find the constant second difference in dollars.

CONCERT SAVINGS

Week	Savings (dollars)
0	10
1	18
2	32
3	52

ANSWER _____

CHALLENGE One step up

For x = 0, 1, 2, 3, 4, the y-values are 1, 6, ___, 28, 45. If the second differences are constant, find the missing value and the second difference. Explain briefly.

WORK SPACE AND ANSWER

ANSWER KEY

Difference Detectives

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the constant second difference: (0, 2), (1, 5), (2, 10), (3, 17).	**2**
2	Find the constant second difference: (0, 18), (1, 17), (2, 12), (3, 3).	**-4**
3	Find the first differences and the constant second difference: (0, 1), (2, 9), (4, 25), (6, 49).	**First differences: 8, 16, 24. Constant second difference: 8.**
4	Find the constant second difference: (-2, 19), (-1, 8), (0, 7), (1, 16).	**10**

PART 2 · APPLY IT

1. **-4 feet** The first differences are 6, 2, and -2 feet, so both second differences are -4 feet.
2. **6 dollars** The first differences are 8, 14, and 20 dollars, so both second differences are 6 dollars.

CHALLENGE

The missing value is 15, and the constant second difference is 4. The first differences are 5, 9, 13, and 17, which increase by 4 each time.

Second differences are differences between consecutive first differences, not differences between y-values. Accept answers with or without units when the context makes the units clear.