LESSON MAKER PRO

Remainder Reveal

Use polynomial values to find remainders quickly.

HIGH SCHOOL · MA.912.AR.6.2

MA.912.AR.6.2 "Explain and apply the Remainder Theorem to solve mathematical and real-world problems."

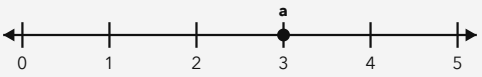
NAME _____ **DATE** _____

THE REMAINDER RULE

When a polynomial P(x) is divided by x - a, the remainder is P(a). Substitute a into every term of the polynomial, then simplify. On a graph of y = P(x), this remainder is the y-value when x = a.

WORKED EXAMPLE

The number line marks a. Use the Remainder Theorem to find the remainder when $P(x) = 2x^3 - x^2 + 4x - 7$ is divided by x - a.



1. The marked value is a = 3.
2. The remainder is P(3).
3. $P(3) = 2(3^3) - 3^2 + 4(3) - 7$.
4. $P(3) = 54 - 9 + 12 - 7 = 50$.

Answer: 50

PRACTICE 6 problems

1 The number line marks a. Find the remainder when $F(x) = x^3 + 6x^2 - 8$ is divided by x - a.



ANSWER _____

2 The number line marks a. Find the remainder when $G(x) = x^3 - 6x + 1$ is divided by x - a.



ANSWER _____

3 Find the remainder when $R(x) = x^4 - 5x^2 + 9$ is divided by x - 1.

ANSWER _____

4 Find the remainder when $S(x) = 5x^3 - 8x^2 + 9x - 6$ is divided by x + 1.

ANSWER _____

5 Find k so that $V(x) = x^3 + kx^2 - 8x + 9$ has remainder 0 when divided by x - 5.

ANSWER _____

6 Find the remainder when $T(x) = x^4 + 6x^2 - 5x + 8$ is divided by x + 1.

ANSWER _____

APPLY IT Show your work

1 A drone club models a drone's height, in meters, t seconds after launch with $H(t) = -t^3 + 8t^2 + t + 6$. The club divides H(t) by t - 5. Find the remainder and state the drone's modeled height at 5 seconds.

WORK SPACE

ANSWER _____

2 A student coding a music app uses the polynomial $C(n) = n^3 - 5n^2 + 8n + 9$ for a sound-adjustment score after n bonus rounds. The program divides C(n) by n - 6. Find the remainder and identify the input value used.

WORK SPACE

ANSWER _____

CHALLENGE One step up

$P(x) = x^3 + ax^2 + bx + 8$ has remainder 13 when divided by x - 1 and remainder -5 when divided by x + 1. Find a and b. Show how each given remainder creates an equation.

WORK SPACE AND ANSWER

ANSWER KEY

Remainder Reveal

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	The number line marks a. Find the remainder when $F(x) = x^3 + 6x^2 - 8$ is divided by x - a.	**17**
2	The number line marks a. Find the remainder when $G(x) = x^3 - 6x + 1$ is divided by x - a.	**96**
3	Find the remainder when $R(x) = x^4 - 5x^2 + 9$ is divided by x - 1.	**5**
4	Find the remainder when $S(x) = 5x^3 - 8x^2 + 9x - 6$ is divided by x + 1.	**-28**
5	Find k so that $V(x) = x^3 + kx^2 - 8x + 9$ has remainder 0 when divided by x - 5.	**k = -94/25**
6	Find the remainder when $T(x) = x^4 + 6x^2 - 5x + 8$ is divided by x + 1.	**20**

PART 2 · APPLY IT

1. **The remainder is 86, so H(5) = 86 meters.** By the Remainder Theorem, the remainder from division by t - 5 is H(5). Substitute 5 to get -125 + 200 + 5 + 6 = 86.
2. **The remainder is 93, and the input value is n = 6.** Division by n - 6 means evaluate C(6). C(6) = 216 - 180 + 48 + 9 = 93.

CHALLENGE

a = -4 and b = 8. P(1) = 13 gives a + b = 4, and P(-1) = -5 gives a - b = -12.

Accept correct substitution into P(a), including unsimplified expressions that evaluate to the stated remainder. For the challenge, accept any valid pair of equations from P(1) = 13 and P(-1) = -5 that leads to a = -4 and b = 8.