

Reading the Structure of Expressions

Grade 9 – Algebra 1 math · Worksheet Answer Key · Standards: A-SSE.A.1a, A-SSE.A.1b, N-RN.B.3

Each answer key states the structure first, then the computation. When a problem asks for an interpretation, a full sentence with the units is the expected answer, because it shows that the meaning of each part was understood.

Standards: A-SSE.A.1a, A-SSE.A.1b, N-RN.B.3 · **Level:** Grade 9 Algebra 1

Problem 1 Count the terms

Separate at the + and – signs: $6x^2$, $-4x$, 9.

3 terms

Problem 2 Coefficients and constant

The coefficient of a is 8; of b it is -5 (the sign belongs to the term). The constant term is 2.

8, -5 and constant 2

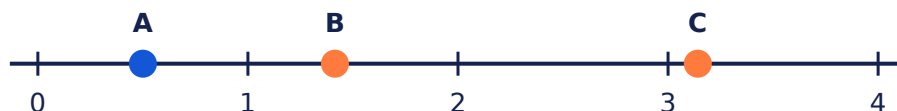
Problem 3 Factors of a term

The term is a product of 7, x and y .

7, x , y

Problem 4 Classify points on a line

$1/2$ is a quotient of integers, so it is rational. $\sqrt{2}$ and π have decimals that never end or repeat.



Orange points are irrational.

B ($\sqrt{2}$) and C (π) are irrational.

Problem 5 Factors of a product

The expression is a product of three factors: 2, $(x + 5)$ and $(x - 1)$.

3 factors

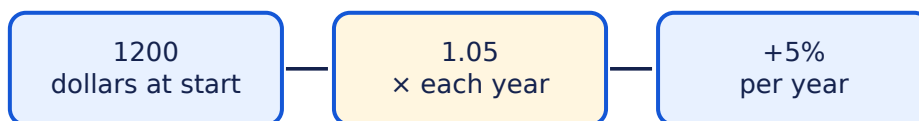
Problem 6 Gym membership

The term $35m$ is 35 dollars for each month. The constant 20 does not change with m , so it is a one-time sign-up fee of 20 dollars.

35 = cost per month; 20 = fixed sign-up fee

Problem 7 Interpret an exponential

At $t = 0$ the amount is $1200(1.05)^0 = 1200$, the starting deposit. Each year multiplies by 1.05, so the balance grows 5% per year.



Starting amount, growth factor, growth rate.

1200 = starting deposit; 1.05 = yearly growth factor (5% growth)

Problem 8 Factored view

The factor $(n + 3)$ is the number of people: n students plus 3 chaperones. The factor 4 is tickets per person.

$(n + 3)$ = people; 4 = tickets per person

Problem 9 Rational plus irrational

Suppose $5 + \sqrt{3}$ were rational. Subtracting the rational number 5 would give a rational result, but $\sqrt{3}$ is irrational. That is a contradiction.

$5 + \sqrt{3}$ is irrational.

Problem 10 Rational times irrational

If $(\frac{2}{3})\sqrt{5}$ were rational, multiplying by the rational number $\frac{3}{2}$ would make $\sqrt{5}$ rational, which it is not.

Irrational

Problem 11 Two irrationals, rational sum

The number $3 - \sqrt{7}$ is irrational (rational minus irrational). The sum is $\sqrt{7} + (3 - \sqrt{7}) = 3$.

The sum is 3, a rational number.

Problem 12 Product of two roots

$$\sqrt{2} \cdot \sqrt{8} = \sqrt{16} = 4.$$

Check: $\sqrt{8} \approx 2.828$ and $1.414 \times 2.828 \approx 4$.

Rational (equal to 4)

Problem 13 Draining tank

80 is the starting amount; $-6t$ is the total drained after t minutes (6 gallons per minute).

When $t = 5$: $80 - 6(5) = 80 - 30 = 50$.

50 gallons

Problem 14 Evaluate a growth expression

$$(1.03)^2 = 1.0609. \text{ Then } 800 \times 1.0609 = 848.72.$$

After 2 years, 800 dollars grows to **\$848.72**.

Problem 15 Savings account

Growth factor: $1 + 0.04 = 1.04$. Then $1.04^3 = 1.124864$ and $2,500 \times 1.124864 = 2,812.16$.

A = \$2,812.16, with growth factor 1.04

Problem 16 Bike rental plans

(a) Shop A: fixed 15 versus 3.

(b) Shop B: 8 per hour versus 6.

(c) A: $15 + 6(4) = 39$. B: $3 + 8(4) = 35$.

(a) Shop A (b) Shop B (c) \$39 and \$35

Problem 17 Garden perimeter

$$2(w + w + 8) = 2(2w + 8) = 4w + 16.$$

The term $4w$ counts the four widths' worth of fence; 16 is the two extra 8-foot stretches. For $w = 6$: $4(6) + 16 = 40$.

$$\begin{aligned}\text{Perimeter} &= 2(w + w + 8) \\ &= 2(2w + 8) \\ &= 4w + 16 \\ w = 6: &4(6) + 16 = 40\end{aligned}$$

Simplifying the perimeter.

Perimeter = $4w + 16$; 40 feet when $w = 6$

Problem 18 Circular pond

Circumference: $2\pi(2.5) = 5\pi$. Area: $\pi(6.25) = 6.25\pi$.

Each is a nonzero rational number times π , so each is irrational.

$5\pi \approx 15.71$ and $6.25\pi \approx 19.63$.

Both are irrational: about 15.71 m and 19.63 m²

Problem 19 Car value

(a) The factor 0.85 keeps 85% of the value, so 15% is lost each year.

(b) $0.85^3 = 0.614125$. Then $24,000 \times 0.614125 = 14,739$.

(a) 15% per year (b) \$14,739

Problem 20 Compare two accounts

$1.015^8 \approx 1.126493$, so A $\approx$ \$1,126.49.

$1.03^4 = 1.12550881$, so B $\approx$ \$1,125.51.

Difference: $1,126.49 - 1,125.51 = 0.98$.

Account A is larger by about \$0.98