

# Algebra 1 · Interpreting Expressions and Real Numbers · Worksheet Answer Key

Common Core A-SSE.A.1a, A-SSE.A.1b, N-RN.B.3 · mathovore.fr

Each solution shows the reasoning, including the interpretation of every part of an expression and the justification for every rational or irrational classification. Compare your work step by step and revisit the lesson on any item you missed.

## Algebra 1 Common Core: A-SSE.A.1a · A-SSE.A.1b · N-RN.B.3

### Problem 1: Terms of an expression

Terms are separated by addition or subtraction, and each sign goes with the term after it:  $5x^2$ ,  $-3x$  and  $7$ .

|                                |                                   |                                |
|--------------------------------|-----------------------------------|--------------------------------|
| $5x^2$                         | $-3x$                             | $+7$                           |
| <b>term 1</b><br>coefficient 5 | <b>term 2</b><br>coefficient $-3$ | <b>term 3</b><br>constant term |

Three terms.

**3 terms:**  $5x^2$ ,  $-3x$ ,  $7$

### Problem 2: Coefficients

$7y^3$  has coefficient  $7$ . The term  $-y = -1 \cdot y$  has coefficient  $-1$ . The term  $12$  is a constant and has no variable.

$7$  and  $-1$

### Problem 3: Constant term

The only term without a variable is  $-11$ , and the sign stays with it.

$-11$

### Problem 4: Factors of a term

$$7xy^2 = 7 \cdot x \cdot y \cdot y.$$

**Factors**  $7, x, y, y$ : **4 factors**

## Problem 5: Sum or product

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$3(x+2)$  is a product of the factors 3 and  $(x+2)$ . In  $3(x+2)+5x$ , the plus sign between  $3(x+2)$  and  $5x$  splits it into two terms.

**Product; terms  $3(x+2)$  and  $5x$**

## Problem 6: Cost expression

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12 is the price of one ticket, 5 is the one-time service fee, and  $12t$  is the cost of the tickets alone.

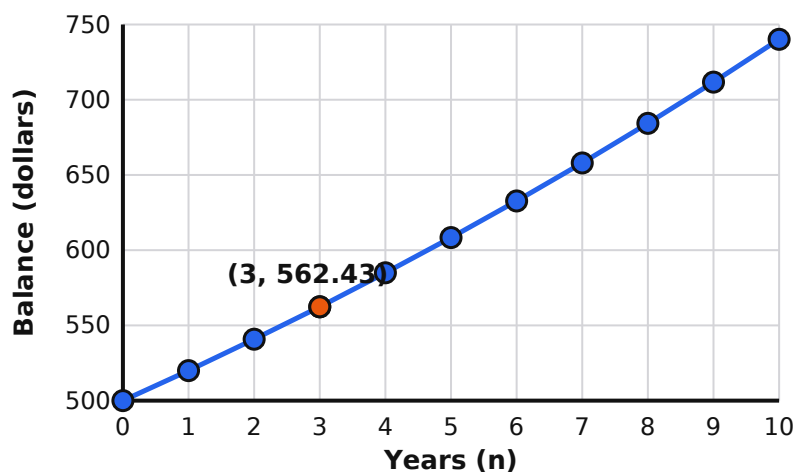
$t=1$ :  $12+5=17$ .  $t=2$ :  $24+5=29$ .  $t=3$ :  $36+5=41$ .

\$17, \$29, \$41

## Problem 7: Evaluating $P(1 + r)^n$

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$500(1.04)^3 = 500 \times 1.124864 = 562.432$ .



The point for year 3 is on the growth curve.

\$562.43

## Problem 8: Growth factor

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Multiplying by 1.04 gives  $100\%+4\%=104\%$  of the old balance: the original amount plus 4% of it.

$900 \times 1.04 = 936$ .

\$936

### Problem 9: Reading a growth model

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The starting amount is 1200 (when  $t = 0$ ,  $A = 1200$ ). The growth factor is  $1.05 = 1 + 0.05$ , so the rate is 5% per year.

$$A = 1200(1.05)^2 = 1200 \times 1.1025 = 1323.$$

\$1,200 ; 5% ; \$1,323.00

### Problem 10: Growth or decay

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The factor  $0.92 < 1$ , so this is decay.  $0.92 = 1 - 0.08$ , so the value drops 8% each year.

$$V = 800(0.92)^2 = 800 \times 0.8464 = 677.12.$$

**Decay, 8% per year, \$677.12**

### Problem 11: Factors of an expression

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The expression is a product of the factors  $(x+4)$  and  $(x-1)$ . The terms of  $x+4$  are  $x$  and 4. The terms of  $x-1$  are  $x$  and  $-1$ .

**Factors  $(x+4)$  and  $(x-1)$**

### Problem 12: Rational or irrational

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$\sqrt{49} = 7$  is rational.  $\sqrt{20}$  is not a perfect square root, so it is irrational.  $\frac{22}{7}$  is a fraction, so it is rational.  $0.\bar{3} = \frac{1}{3}$  is rational.  $\frac{\pi}{2}$  is irrational.  $\sqrt{\frac{9}{4}} = \frac{3}{2}$  is rational.

**Irrational:  $\sqrt{20}$  and  $\frac{\pi}{2}$ ; the rest are rational**

### Problem 13: Sum of rationals

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$$\frac{15}{20} + \frac{12}{20} = \frac{27}{20}, \text{ a quotient of two integers.}$$

$\frac{27}{20}$ , rational

### Problem 14: Rational plus irrational

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A rational number plus an irrational number is irrational.  $\sqrt{2} \approx 1.414$ , so  $5 + \sqrt{2} \approx 6.414$ .

**Irrational, about 6.414**

### Problem 15: A nonzero rational times an irrational

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$3\sqrt{5}$  is a nonzero rational times an irrational, so it is irrational.  $0\cdot\sqrt{5}=0$ , which is rational, because the rule requires the rational factor to be nonzero.

$3\sqrt{5}$  **irrational**;  $0\cdot\sqrt{5}=0$  **rational**

### Problem 16: Product of irrationals

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$\sqrt{2}\cdot\sqrt{8}=\sqrt{16}=4$ , which is rational.  $\sqrt{3}\cdot\sqrt{5}=\sqrt{15}$ , and 15 is not a perfect square, so it is irrational.

**First rational (4); second irrational**

### Problem 17: Sum of irrationals

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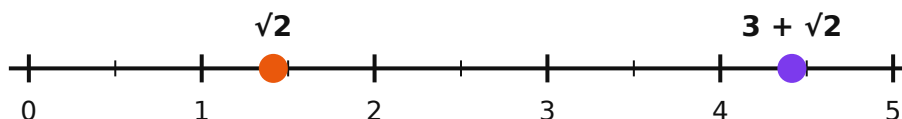
$(3+\sqrt{5})+(3-\sqrt{5})=6$ , which is rational because the irrational parts cancel.  $\sqrt{2}+\sqrt{2}=2\sqrt{2}$ , a nonzero rational times an irrational, so it is irrational.

**First rational (6); second irrational**

### Problem 18: Why the sum is irrational

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Suppose  $q+s=t$  were rational. Then  $s=t-q$ , a difference of two rational numbers, which is rational. That contradicts  $s$  being irrational, so  $q+s$  is irrational.



The distance from  $\sqrt{2}$  to  $\sqrt{2} + 3$  is 3, but both points are irrational.

**Assuming a rational sum forces  $s$  to be rational, a contradiction**

### Problem 19: A square's perimeter

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Side  $=\sqrt{50}=\sqrt{25\cdot 2}=5\sqrt{2}$  in, irrational.

Perimeter  $=4\cdot 5\sqrt{2}=20\sqrt{2}\approx 28.28$  in, a nonzero rational times an irrational, so irrational.

$5\sqrt{2}$  in;  $20\sqrt{2}\approx 28.28$  in; **both irrational**

### Problem 20: A circle's circumference

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$C=2\pi\cdot\frac{3}{2}=3\pi\approx 9.42$  ft, a nonzero rational times  $\pi$ , so irrational.

If  $r=\frac{4}{\pi}$ , then  $2\pi r=2\pi\cdot\frac{4}{\pi}=8$ , which is rational, because  $\pi$  is itself irrational.

$3\pi$  ft, irrational;  $r = \frac{4}{\pi}$  gives 8

### Problem 21: A sale price

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$0.75 = 1 - 0.25$  is the factor for a 25% discount,  $0.75p$  is the discounted price, and 5 is the coupon amount subtracted afterward.

$$0.75(64) - 5 = 48 - 5 = 43.$$

\$43

### Problem 22: Investment growth

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The factor is  $1 + 0.035 = 1.035$ , so the balance is  $2000(1.035)^n$ .

For  $n = 4$ :  $2000 \times 1.147523 \approx 2295.05$ . Interest:  $2295.05 - 2000 = 295.05$ .

$2000(1.035)^n$ ; \$2,295.05; \$295.05 interest

### Problem 23: Sums that are rational

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(a)  $3 + 4 = 7$ , rational. (b)  $\sqrt{12} = 2\sqrt{3}$ , so the sum is  $3\sqrt{3}$ , irrational. (c) The sum is 0, rational. (d) Rational plus irrational is irrational.

(a) and (c)

### Problem 24: Two accounts

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A is multiplied by 1.03 each year (it grows 3% of its current balance). B adds the same \$40 each year.

$n = 10$ :  $A = 1000(1.03)^{10} \approx 1343.92$  and  $B = 1400$ , so B is larger.

$n = 20$ :  $A \approx 1806.11$  and  $B = 1800$ , so A is now larger.

**B leads at 10 years, A leads at 20 years**