

Rational or Irrational

Determine if the number is rational (R) or irrational (I).

- 1) 61π **Irrational because** π
 - 2) 42 **Rational**
 - 3) $75.082\overline{106}$ **Rational because it repeats**
 - 4) $\sqrt{101}$ **Irrational because of radical**
 - 5) $65.42\overline{79}$ **Rational because it repeats**
 - 6) $\frac{20}{6}$ **Rational because it is a fraction**
 - 7) π **Irrational because of** π
 - 8) $5.62\overline{13}$ **Rational because it repeats**
 - 9) $\frac{98}{16}$ **Rational because it is a fraction**
 - 10) 39 **Rational**
 - 11) $89.396668\ldots$ **Irrational because does not terminate or repeat**
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Verbal Expressions

15) the quotient of a number and 6

$$\frac{n}{6} \text{ or } n \div 6$$

16) v squared

$$v^2$$

17) t more than 9

$$t + 9$$

18) 3 cubed

$$3^3$$

19) the quotient of 24 and 8

$$\frac{24}{8} \text{ or } 24 \div 8$$

20) the sum of 2 and 12

$$2 + 12$$

21) p cubed

$$p^3$$

22) the product of 5 and x

$$5x$$

23) 2 to the 4th

$$2^4$$

24) twice 11

$$2(11)$$

Write each algebraic expression as a variable expression

1) $2n$

twice a number n

3) $3n + 4$

4 more than 3 times a number, n

2) n^2

n squared

4) $4(n-2)$

4 times the difference of n and 2

Simplifying Radical Expressions

Simplify.

1) $\sqrt{125n}$

$(5)^{\wedge} 25$
 $(5)(5)$

$5\sqrt{5n}$

2) $\sqrt{216v}$

$(2)^{\wedge} 108$
 $(3)(3)(3)^{\wedge} 12$
 $(3)(3)(3)(3)^{\wedge} 4$
 $(2)(2)$

$3 \cdot 2\sqrt{3 \cdot 2v}$

$6\sqrt{6v}$

3) $\sqrt{512k^2}$

$(2)^{\wedge} 256$
 $(2)^{\wedge} 128$
 $(2)^{\wedge} 64$
 $(2)^{\wedge} 32$
 $(2)^{\wedge} 16$
 $(2)^{\wedge} 8$
 $(2)^{\wedge} 4$
 $(2)^{\wedge} 2$
 $(2)(2)$

$2 \cdot 2 \cdot 2 \cdot 2 k\sqrt{2}$

$16k\sqrt{2}$

4) $\sqrt{512m^3}$

$mmmm$

$16m\sqrt{2m}$

5) $\sqrt{216k^4}$

$(k)(k)$
 $(2)^{\wedge} 108$
 $(2)^{\wedge} 54$
 $(2)^{\wedge} 27$
 $(3)(3)(3)$
 $(3)(3)$
 $kkkk$

6) $\sqrt{100v^3}$

$(2)^{\wedge} 50$
 $(2)^{\wedge} 25$
 $(5)(5)$
 vVV

$10v\sqrt{v}$

$2 \cdot 3 \cdot k^2 \sqrt{2 \cdot 3}$

$6k^2\sqrt{6}$

Adding and Subtracting Radicals

17) $3\sqrt{18} - 2\sqrt{2}$

$\begin{matrix} \textcircled{3} \\ \uparrow \\ 3 \cdot 6 \\ \downarrow \end{matrix}$

$7\sqrt{2}$

$9\sqrt{2} - 2\sqrt{2}$

19) $3\sqrt{18} + 3\sqrt{12} + 2\sqrt{27}$

$\begin{matrix} \textcircled{4} & \textcircled{3} \\ \uparrow & \uparrow \\ 3 & 3 \\ \downarrow & \downarrow \end{matrix}$

$3\sqrt{2} + 6\sqrt{3} + 6\sqrt{3}$

$3\sqrt{2} + 12\sqrt{3}$

21) $-3\sqrt{2} + 3\sqrt{20} - 3\sqrt{8}$

$\begin{matrix} \textcircled{2} & \textcircled{4} \\ \uparrow & \uparrow \\ 2 & 2 \\ \downarrow & \downarrow \end{matrix}$

$-3\sqrt{2} + 6\sqrt{5} - 6\sqrt{2}$

$-9\sqrt{2} + 6\sqrt{5}$

18) $-3\sqrt{18} + 3\sqrt{8} - \sqrt{24}$ $-3\sqrt{2} - 2\sqrt{6}$

$\begin{matrix} \textcircled{9} & \textcircled{4} & \textcircled{6} \\ \uparrow & \uparrow & \uparrow \\ 3 & 2 & 2 \\ \downarrow & \downarrow & \downarrow \end{matrix}$

$-9\sqrt{2} + 6\sqrt{2} - 2\sqrt{6}$

20) $-3\sqrt{5} - \sqrt{6} - \sqrt{5}$

$-4\sqrt{5} - \sqrt{6}$

22) $-3\sqrt{3} - \sqrt{8} - 3\sqrt{3}$

$\begin{matrix} \textcircled{3} \\ \uparrow \\ 3 \cdot 2 \\ \downarrow \end{matrix}$

$-3\sqrt{3} - 2\sqrt{2} - 3\sqrt{3}$

$-6\sqrt{3} - 2\sqrt{2}$

Multiplying Radicals

$$7) \sqrt{15n^2} \cdot \sqrt{10n^3}$$

$$\sqrt{150n^5}$$

$$5n^2 \sqrt{6n}$$

$$150$$

$$15 \hat{=} 10$$

$$3 \cdot 5 \hat{=} 5$$

$$\eta \eta \eta \eta \eta$$

$$9) -3\sqrt{7r^3} \cdot 6\sqrt{7r^2}$$

$$-18 \sqrt{49r^5}$$

$$-18 \cdot 7r^2 \sqrt{r}$$

$$-126 r^2 \sqrt{r}$$

$$49$$

$$\hat{=} 7 \cdot 7$$

$$r r r r r$$

$$11) \sqrt{3}(5 + \sqrt{3})$$

$$5\sqrt{3} + \sqrt{3} \cdot \sqrt{3}$$

$$5\sqrt{3} + 3$$

$$8) \sqrt{18a^2} \cdot 4\sqrt{3a^2}$$

$$3 \cdot 4 \sqrt{54a^4}$$

$$12a^2 \sqrt{6}$$

$$54$$

$$\hat{=} 18 \cdot 3$$

$$9 \cdot 2 \cdot 3$$

$$3 \cdot 3 \cdot 3$$

$$a \cdot a \cdot a$$

$$10) -4\sqrt{28x} \cdot \sqrt{7x^3}$$

$$-4 \sqrt{196x^4}$$

$$-4 \cdot 14x^2$$

$$-56x^2$$

$$12) 2\sqrt{5}(\sqrt{6} + 2)$$

$$2\sqrt{5} \cdot \sqrt{6} + 2\sqrt{5} \cdot 2$$

$$2\sqrt{30} + 4\sqrt{5}$$

Adding and Subtracting Polynomials

Simplify each expression.

1) $(5p^2 - 3) + (2p^2 - 3p^3)$

$$-3p^3 + 7p^2 - 3$$

2) $(a^3 - 2a^2) + (3a^2 + 4a^3)$

$$5a^3 - 5a^2$$

5) $(3a^2 + 1) - (4 - 2a^2)$

$$a^2 - 3$$

6) $(4r^3 + 3r^4) - (r^4 + 5r^3)$

$$2r^4 + 9r^3$$

9) $(-4k^4 + 14 + 3k^2) + (-3k^4 - 14k^2 - 8)$

$$-7k^4 - 11k^2 + 6$$

10) $(3 - 6n^5 - 8n^4) + (46n^4 + 3n + 8n^5)$

$$2n^5 - 2n^4 + 3n + 3$$

Multiplying Polynomials

15) $(6n + 3)(6n - 4)$

	$6n$	$+3$
$6n$	$36n^2$	$18n$
-4	$-24n$	-12

$$36n^2 - 6n - 12$$

16) $(8n + 1)(6n - 3)$

	$8n$	$+1$
$6n$	$48n^2$	$6n$
-3	$-24n$	-3

$$48n^2 - 18n - 3$$

17) $(6k + 5)(5k + 5)$

	$6k$	$+5$
$5k$	$30k^2$	$+25k$
$+5$	$+30k$	$+25$

$$30k^2 + 55k + 25$$

18) $(3x - 4)(4x + 3)$

	$3x$	-4
$4x$	$12x^2$	$-16x$
$+3$	$9x$	-12

$$12x^2 - 7x - 12$$

19) $(4a + 2)(6a^2 - a + 2)$

	$6a^2$	$-a$	$+2$
$4a$	$24a^3$	$-4a^2$	$+8a$
2	$12a^2$	$-2a$	$+4$

$$24a^3 + 8a^2 + 6a + 4$$

20) $(7k - 3)(k^2 - 2k + 7)$

	k^2	$-2k$	$+7$
$7k$	$7k^3$	$-14k^2$	$+49k$
-3	$-3k^2$	$+6k$	-21

$$7k^3 - 17k^2 + 55k - 21$$

Practice with Word Problems and Polynomials

1. A triangle has three sides with the following lengths: $2x+1$ units, $3x+5$ units, and $4x-1$ units. Write a simplified algebraic expression for the **perimeter** of the triangle.

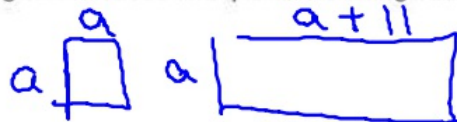
$$\begin{array}{r} 2x+1 \\ + 3x+5 \\ + 4x-1 \\ \hline 9x+5 \end{array}$$

2. An octagon has sides that all have a length of y . Write a simplified algebraic expression for the **perimeter** of the octagon in terms of y .

Octagon = 8 sides $8y$

$$y + y + y + y + y + y + y + y$$

3. A square has an unknown length and width. If its length is increased by 11 units to create a new, larger rectangle, write a simplified algebraic expression for the **area** of the new rectangle in terms of a if a represents the length of the original square.



$$\begin{array}{l} a(a+11) \\ a^2 + 11a \end{array}$$

4. The width of a rectangle is unknown. The length of the rectangle is two more units than its width. Write a simplified algebraic expression for the **area** of the rectangle in terms of width (w).



$$w(2w+2) = 2w^2 + 2w$$

5. The formula for the area of a triangle is $\text{Area} = \frac{1}{2} \cdot \text{base} \cdot \text{height}$. If the base of a triangle has a length of $8x$ units, and the height is $x+6$ units, write a simplified algebraic expression for the **area** of the triangle in terms of x .

$$\frac{1}{2} (\cancel{8x}) (x+6)$$

$$4x(x+6) = 4x^2 + 24x$$

Miscellaneous

1. How many terms are in the simplified expression:

$$4 : 35x^3 + 10x^2 - 3x - 17x^2 + 2x + 129$$

What is the degree of this expression?

3

What is the leading co-efficient of this polynomial?

35

2. Write the following as an algebraic expression.

- X decreased by 10 plus y squared $x - (10 + y^2)$
- X times 10 plus 2 y $10x + 2y$
- 10 less than x cubed $x^3 - 10$
- 6 times the sum of n and 8 $6(n + 8)$
- 6 times n increased by 8 $6n + 8$

3. Fill in the blank

- One term is called a monomial.
- Two terms are called a binomial.
- Three terms are called a trinomial.
- Many terms are called polynomial.

