N.RN.B.3: Operations with Radicals 1

1 Which expression represents an irrational number?
1) $\sqrt{16}+\sqrt{1}$
2) $\sqrt{25}+\sqrt{4}$
3) $\sqrt{36}+\sqrt{7}$
4) $\sqrt{49}+\sqrt{9}$

2 Which sum is irrational?
1) $-2\sqrt{12}+\sqrt{100}$
2) $-\sqrt{4}+\frac{1}{3}\sqrt{900}$
3) $\frac{1}{2}\sqrt{25}+\sqrt{64}$
4) $\sqrt{49}+3\sqrt{121}$

3 For which value of P and W is $P+W$ a rational number?
1) $P=\frac{1}{\sqrt{3}}$ and $W=\frac{1}{\sqrt{6}}$
2) $P=\frac{1}{\sqrt{4}}$ and $W=\frac{1}{\sqrt{9}}$
3) $P=\frac{1}{\sqrt{6}}$ and $W=\frac{1}{\sqrt{10}}$
4) $P=\frac{1}{\sqrt{25}}$ and $W=\frac{1}{\sqrt{2}}$

4 Given: $L=\sqrt{2}$
$M=3\sqrt{3}$
$N=\sqrt{16}$
$P=\sqrt{9}$
Which expression results in a rational number?
1) $L+M$
2) $M+N$
3) $N+P$
4) $P+L$

5 The product of $\sqrt{576}$ and $\sqrt{684}$ is
1) irrational because both factors are irrational
2) rational because both factors are rational
3) irrational because one factor is irrational
4) rational because one factor is rational

6 Which expression results in a rational number?
1) $\sqrt{2}\cdot\sqrt{18}$
2) $5\cdot\sqrt{5}$
3) $\sqrt{2}+\sqrt{2}$
4) $3\sqrt{2}+2\sqrt{3}$

7 Which expression results in a rational number?
1) $\sqrt{121}-\sqrt{21}$
2) $\sqrt{25}\bullet\sqrt{50}$
3) $\sqrt{36}\div\sqrt{225}$
4) $3\sqrt{5}+2\sqrt{5}$

8 Which expression results in an irrational number?
1) $\sqrt{3}\cdot\sqrt{3}$
2) $-\frac{2}{3}+\frac{1}{4}$
3) $5\cdot\sqrt{81}$
4) $\frac{1}{3}+\sqrt{3}$

9 Given the following expressions:
I. $-\frac{5}{8}+\frac{3}{5}$ III. $\left(\sqrt{5}\right)\cdot\left(\sqrt{5}\right)$
II. $\frac{1}{2}+\sqrt{2}$ IV. $3\cdot\left(\sqrt{49}\right)$
Which expression(s) result in an irrational number?
1) II, only
2) III, only
3) I, III, IV
4) II, III, IV

10 If $x = 2$, $y = 3\sqrt{2}$, and $w = 2\sqrt{8}$, which expression results in a rational number?
1) $x + y$
2) $y - w$
3) $(w)(y)$
4) $y \div x$

11 Which statement is *not* always true?
1) The product of two irrational numbers is irrational.
2) The product of two rational numbers is rational.
3) The sum of two rational numbers is rational.
4) The sum of a rational number and an irrational number is irrational.

12 Which statement is *not* always true?
1) The sum of two rational numbers is rational.
2) The product of two irrational numbers is rational.
3) The sum of a rational number and an irrational number is irrational.
4) The product of a nonzero rational number and an irrational number is irrational.

13 Is the product of two irrational numbers always irrational? Justify your answer.

14 Is the product of $\sqrt{16}$ and $\frac{4}{7}$ rational or irrational? Explain your reasoning.

15 State whether the product of $\sqrt{3}$ and $\sqrt{9}$ is rational or irrational. Explain your answer.

16 Is the product of $\sqrt{1024}$ and -3.4 rational or irrational? Explain your reasoning.

17 Determine if the product of $3\sqrt{2}$ and $8\sqrt{18}$ is rational or irrational. Explain your answer.

18 Is the product of $\sqrt{8}$ and $\sqrt{98}$ rational or irrational? Justify your answer.

19 Ms. Fox asked her class "Is the sum of 4.2 and $\sqrt{2}$ rational or irrational?" Patrick answered that the sum would be irrational. State whether Patrick is correct or incorrect. Justify your reasoning.

20 Is the sum of $3\sqrt{2}$ and $4\sqrt{2}$ rational or irrational? Explain your answer.

21 State whether $7 - \sqrt{2}$ is rational or irrational. Explain your answer.

22 State whether $2\sqrt{3} + 6$ is rational or irrational. Explain your answer.

23 Jakob is working on his math homework. He decides that the sum of the expression $\frac{1}{3} + \frac{6\sqrt{5}}{7}$ must be rational because it is a fraction. Is Jakob correct? Explain your reasoning.

24 Classify the expression $\frac{2}{\sqrt{144}} + \frac{\sqrt{169}}{3}$ as rational or irrational. Explain your reasoning.

25 Given: $A = \sqrt{363}$ and $B = \sqrt{27}$
Explain why $A + B$ is irrational. Explain why $A \bullet B$ is rational.

26 A teacher wrote the following set of numbers on the board:
$$a = \sqrt{20} \quad b = 2.5 \quad c = \sqrt{225}$$
Explain why $a + b$ is irrational, but $b + c$ is rational.

N.RN.B.3: Operations with Radicals 1
Answer Section

1 ANS: 3 REF: 062302ai
2 ANS: 1 REF: 062405ai
3 ANS: 2
$\frac{1}{\sqrt{4}} + \frac{1}{\sqrt{9}} = \frac{1}{2} + \frac{1}{3} = \frac{5}{6}$

REF: 081522ai
4 ANS: 3
$\sqrt{16} + \sqrt{9} = \frac{7}{1}$ may be expressed as the ratio of two integers.

REF: 061413ai
5 ANS: 3
$\sqrt{576} = 24 \quad \sqrt{684} = 6\sqrt{19}$

REF: 011808ai
6 ANS: 1
$\sqrt{2} \cdot \sqrt{18} = \sqrt{36} = \frac{6}{1}$ may be expressed as the ratio of two integers.

REF: 061907ai
7 ANS: 3
$\sqrt{36} \div \sqrt{225} = \frac{6}{15}$ may be expressed as the ratio of two integers.

REF: 011903ai
8 ANS: 4 REF: 082407ai
9 ANS: 1 REF: 011604ai
10 ANS: 3
$\left(2\sqrt{8}\right)\left(3\sqrt{2}\right) = 6\sqrt{16} = 24$

REF: 062109ai
11 ANS: 1 REF: 081401ai
12 ANS: 2 REF: 061508ai
13 ANS:
No. The product of $\sqrt{8}$ and $\sqrt{2}$, which are both irrational numbers, is $\sqrt{16}$, which is rational.

REF: 081930ai
14 ANS:
Rational, as $\sqrt{16} \cdot \frac{4}{7} = \frac{16}{7}$, which is the ratio of two integers.

REF: 061831ai

15 ANS:
The product is irrational because $\sqrt{27}$ can not be written as the ratio of two integers.

REF: 012030ai
16 ANS:
Rational, as $\sqrt{1024} \cdot -3.4 = 32 \cdot -3.4 = -108.8$, which is the ratio of two integers, $\frac{-1088}{10}$.

REF: 062225ai
17 ANS:
$3\sqrt{2} \cdot 8\sqrt{18} = 24\sqrt{36} = 144$, which can be written as the ratio of two integers.

REF: 061626ai
18 ANS:
Rational, as $\sqrt{8} \cdot \sqrt{98} = 2\sqrt{2} \cdot \sqrt{49} \cdot \sqrt{2} = 2\sqrt{2} \cdot 7\sqrt{2} = 14 \cdot 2 = 28$, which is the ratio of two integers.

REF: 082227ai
19 ANS:
Correct. The sum of a rational and irrational is irrational.

REF: 011525ai
20 ANS:
$7\sqrt{2}$ is irrational because it can not be written as the ratio of two integers.

REF: 081629ai
21 ANS:
$7 - \sqrt{2}$ is irrational because it can not be written as the ratio of two integers.

REF: 061727ai
22 ANS:
$2\sqrt{3} + 6$ is irrational because it can not be written as the ratio of two integers.

REF: 012426ai
23 ANS:
No. The sum of a rational and irrational is irrational.

REF: 011728ai
24 ANS:
$\frac{2}{\sqrt{144}} + \frac{\sqrt{169}}{3} = \frac{2}{12} + \frac{13}{3}$ The sum of two rational numbers is rational.

REF: 082325ai

25 ANS:

$A + B$ is irrational because $14\sqrt{3}$ cannot be written as the ratio of two integers. $A \bullet B$ is rational because 99 can be written as the ratio of two integers.

REF: 012329ai

26 ANS:

$a + b$ is irrational because it cannot be written as the ratio of two integers. $b + c$ is rational because it can be written as the ratio of two integers, $\frac{35}{2}$.

REF: 081725ai