Math 20–1 — Operations on Radicals

Practice Test

(Simplifying · Combining · Conjugates & Rationalizing · Applications)

Instructions. Show work in the space beside each question. Calculators permitted unless instructed otherwise. For **Numerical Response**, print your answer in the boxes from left to right (no commas or units).

Multiple Choice (1–10)

1) $(\sqrt{7})^5$ is equivalent to

A. $5\sqrt{7}$

B. $7\sqrt{7}$

C. $49\sqrt{7}$

D. $343\sqrt{7}$

2) $\sqrt{\dfrac{x}{4}}$ is equivalent to

A. $\dfrac{\sqrt{x}}{2}$

B. $\dfrac{\sqrt{x}}{4}$

C. $\sqrt{\dfrac{x}{2}}$

D. $2\sqrt{x}$

3) $3\sqrt{27} - \sqrt{12} + \sqrt{3}$ simplifies to

A. $6\sqrt{3}$

B. $7\sqrt{3}$

C. $8\sqrt{3}$

D. $9\sqrt{3}$

4) $(\sqrt{18} - \sqrt{8})^2$ equals

A. 2

B. $2\sqrt{2}$

C. 4

D. $4\sqrt{2}$

5) $\dfrac{3}{\sqrt{5} - \sqrt{2}}$ in simplest form is

A. $\dfrac{3(\sqrt{5}-\sqrt{2})}{3}$

B. $\dfrac{3(\sqrt{5}-\sqrt{2})}{7}$

C. $\sqrt{5}-\sqrt{2}$

D. $\sqrt{5}+\sqrt{2}$

6) A square is inscribed in a circle of area 100π cm^2. The exact perimeter of the square is

A. $20\sqrt{2}$ cm

B. $40\sqrt{2}$ cm

C. 80 cm

D. 100 cm

7) $(2\sqrt{x})(3\sqrt{2x})$ simplifies to

A. $12\sqrt{x}$

B. $6\sqrt{2x}$

C. $6x\sqrt{2}$

D. $6x\sqrt{2x}$

8) $(7-3\sqrt{5})(7+3\sqrt{5})$ equals

A. 4

B. $14\sqrt{5}$

C. $49+45$

D. $49-6\sqrt{5}$

9) $\dfrac{1}{\sqrt{a}+\sqrt{b}}$ (for $a, b > 0$) is equivalent to

A. $\dfrac{\sqrt{a}+\sqrt{b}}{a+b}$

B. $\dfrac{\sqrt{a}-\sqrt{b}}{(a+b)}$

C. $\dfrac{\sqrt{a}-\sqrt{b}}{a-b}$

D. $\dfrac{\sqrt{b}-\sqrt{a}}{a+b}$

10) $\sqrt{50}+3\sqrt{8}-2\sqrt{18}$ simplifies to

A. $3\sqrt{2}$

B. $4\sqrt{2}$

C. $5\sqrt{2}$

D. $6\sqrt{2}$

Numerical Response (11–15)

Record your answer in the boxes.

11) The expression $\sqrt{6}(\sqrt{10}-\sqrt{15})+\sqrt{15}(\sqrt{6}-\sqrt{10})$ can be written in simplest form $a\sqrt{b}-c\sqrt{d}$ with positive integers a, b, c, d. The value of $a+b+c+d$ is $\square\square\square\square$

12) Expand and simplify:

$$\sqrt{2}\,(5\sqrt{3}-2\sqrt{6})+\sqrt{3}\,(\sqrt{8}-3\sqrt{6})=p\sqrt{2}+q\sqrt{3}+r\sqrt{6}.$$

Record the value of $p+q+r$. $\square\square\square$

13) $(2\sqrt{3}+\sqrt{2})^2=a+b\sqrt{6}$. Record the value of $a+b$. $\square\square$

14) $\dfrac{6}{\sqrt{7}-\sqrt{5}}=m\sqrt{7}+n\sqrt{5}$. Record $m+n$. $\square$

15) $\big(3\sqrt{2}+\sqrt{50}\big)\big(2\sqrt{2}-\sqrt{18}\big)=k$. Record k. $\square\square\square$

Written Response — 5 marks

A shaded region is made of a rectangle and an attached right triangle. The rectangle has height $\sqrt{24}$ and width $(4\sqrt{3}+\sqrt{6})$. The triangle shares the same height $\sqrt{24}$ and has hypotenuse $\sqrt{96}$ and horizontal leg x.

1. Determine x in *simplest radical form.* (1 mark)

2. Determine, in simplest radical form, the *total area* of the shaded region. (3 marks)

3. Simplify the exact value of $\sqrt{24}+\sqrt{96}+x$. (1 mark)

Answer Key

1) C 6) B
2) A 7) C
3) C 8) A
4) A 9) C
5) D 10) C

Numerical Response

- 11) $\boxed{2}\,\boxed{8}$ (since $2\sqrt{15}-5\sqrt{6} \Rightarrow a=2, b=15, c=5, d=6$ and $2+15+5+6=28$)
- 12) $\boxed{-6}$ ($-9\sqrt{2}-4\sqrt{3}+7\sqrt{6} \Rightarrow p+q+r=-6$)
- 13) $\boxed{18}$ ($(2\sqrt{3})^2+(\sqrt{2})^2+2\cdot 2\sqrt{3}\cdot\sqrt{2}=14+4\sqrt{6}$)
- 14) $\boxed{6}$ ($\dfrac{6(\sqrt{7}+\sqrt{5})}{7-5}=3(\sqrt{7}+\sqrt{5})$)
- 15) $\boxed{-16}$ $(8\sqrt{2})(-\sqrt{2})=-16$

Written Response (values)

- 1) $x=\sqrt{96-24}=\sqrt{72}=6\sqrt{2}$.
- 2) Rectangle area $=\sqrt{24}(4\sqrt{3}+\sqrt{6})=4\sqrt{72}+\sqrt{144}=24\sqrt{2}+12$.
  Triangle area $=\frac{1}{2}(\sqrt{24})(\sqrt{72})=\frac{1}{2}\sqrt{1728}=12\sqrt{3}$.
  Total $=\boxed{12+24\sqrt{2}+12\sqrt{3}}$.
- 3) $\sqrt{24}+\sqrt{96}+x=2\sqrt{6}+4\sqrt{6}+6\sqrt{2}=\boxed{6\sqrt{6}+6\sqrt{2}=6(\sqrt{6}+\sqrt{2})}$.