Fractions and Radicals Practice Answer Key

Part I : Adding and Subtracting fractions

example: $\dfrac{3}{2}+\dfrac{1}{5}$ common denominator is 10

The numerator and denominator must be multiplied by the same value to keep the fraction the same value. Only add the numerators and keep the denominator the same.

$$\left(\dfrac{5}{5}\right)\dfrac{3}{2}+\dfrac{1}{5}\left(\dfrac{2}{2}\right)=\dfrac{15}{10}+\dfrac{2}{10}=\dfrac{15+2}{10}=\dfrac{17}{10}$$

Simplify the following. **Remember no calculator.**

1. $\dfrac{1}{2}+\dfrac{3}{4}$ $\dfrac{2+3}{4}$ $=\boxed{\dfrac{5}{4}}$

2. $\dfrac{2}{5}-\dfrac{1}{3}$ $=\dfrac{6-5}{15}=\boxed{\dfrac{1}{15}}$

3. $\dfrac{4}{3}-2$ $\dfrac{4}{3}-\dfrac{2}{1}$
$\dfrac{4-6}{3}=\boxed{\dfrac{-2}{3}}$

4. $5+\dfrac{7}{3}$ $\dfrac{15+7}{3}$ $=\boxed{\dfrac{22}{3}}$

5. $\dfrac{1}{6}-\dfrac{3}{5}$ $=\dfrac{5-18}{30}=\boxed{\dfrac{-13}{30}}$

6. $2-\dfrac{1}{3}-\dfrac{2}{5}$ $\dfrac{30-5-6}{15}$

Part II: Simplifying Radicals

A radical can be simplified if the **radicand** can be divided by a **perfect square**. The radicand is the number under the radical sign. A **perfect square** is a number that can square rooted evenly. In the number $\sqrt{9}$ the 9 is the radicand and 9 is a perfect square. Since you are not using calculators we will keep this numbers small. Think about $\{4,9,16,25,36,49,64,81,100\}$

Example: $\sqrt{50}=\sqrt{25\times2}=\sqrt{25}\times\sqrt{2}=5\sqrt{2}$
$\sqrt{45}=\sqrt{9\times5}=\sqrt{9}\times\sqrt{5}=3\sqrt{5}$

Simplify

7. $\sqrt{12}$ $\sqrt{4\cdot3}$ $\boxed{2\sqrt{3}}$

8. $\sqrt{32}$ $\sqrt{16\cdot2}$ $\boxed{4\sqrt{2}}$

9. $\sqrt{75}$ $\sqrt{25\cdot3}$ $\boxed{5\sqrt{3}}$

10. $\sqrt{200}$ $\sqrt{2\cdot100}=\sqrt{2}\times10$ $\boxed{10\sqrt{2}}$

11. $\sqrt{54}$ $\sqrt{9\times6}$ $\boxed{3\sqrt{6}}$

12. $\sqrt{28}$ $\sqrt{4\times7}$ $\boxed{2\sqrt{7}}$

13. $\sqrt{192}$ $\sqrt{4\cdot48}$
$2\sqrt{48}$
$2\sqrt{16\cdot3}=\boxed{8\sqrt{3}}$

14. $2\sqrt{48}$ $2\sqrt{16\cdot3}$ $\boxed{8\sqrt{3}}$

15. $5\sqrt{400}$ $5\sqrt{20\cdot20}$ $\boxed{100}$

Part III: Putting it all together

Ok... let's move from grade 9 and 10 in to grade 11. In many of the questions you are going to be working with, you will need to combine your skills of fractions and radicals to get the proper answer. We will express all our answers as a single fraction with one denominator.

Example 1: $$2\pm\frac{\sqrt{12}}{3}=\frac{6}{3}\pm\frac{2\sqrt{3}}{3}=\frac{6\pm2\sqrt{3}}{3}$$

Example 2: $$\frac{1}{3}\pm\sqrt{\frac{5}{9}}=\frac{1}{3}\pm\frac{\sqrt{5}}{\sqrt{9}}=\frac{1}{3}\pm\frac{\sqrt{5}}{3}=\frac{1\pm\sqrt{5}}{3}$$

Example 3: $$7\pm\sqrt{\frac{12}{5}}=7\pm\frac{\sqrt{12}}{\sqrt{5}}=7\pm\frac{2\sqrt{3}}{\sqrt{5}}\times\frac{\sqrt{5}}{\sqrt{5}}=\frac{35}{5}\pm\frac{2\sqrt{15}}{5}=\frac{35\pm2\sqrt{15}}{5}$$

Simplify the following.

16. $1+\dfrac{\sqrt{3}}{2}$ $\dfrac{2}{2}+\dfrac{\sqrt{3}}{2}=\boxed{\dfrac{2+\sqrt{3}}{2}}$

17. $-3\pm\dfrac{\sqrt{18}}{4}$ $\dfrac{-3}{1}\pm\dfrac{3\sqrt{2}}{4}$ $\boxed{\dfrac{-12\pm3\sqrt{2}}{4}}$

18. $2\pm\sqrt{\dfrac{2}{3}}$ $\dfrac{\sqrt{2}}{\sqrt{3}}\cdot\dfrac{\sqrt{3}}{\sqrt{3}}=\dfrac{\sqrt{6}}{3}$ $\dfrac{2}{1}\pm\dfrac{\sqrt{6}}{3}$ $\boxed{\dfrac{6\pm\sqrt{6}}{3}}$

19. $7\pm\sqrt{\dfrac{27}{7}}$ $\dfrac{\sqrt{27}}{\sqrt{7}}=\dfrac{3\sqrt{3}}{\sqrt{7}}\cdot\dfrac{\sqrt{7}}{\sqrt{7}}=\dfrac{3\sqrt{21}}{7}$ $\dfrac{7}{1}\pm\dfrac{3\sqrt{21}}{7}$ $\boxed{\dfrac{49\pm3\sqrt{21}}{7}}$

20. $-5\pm\sqrt{\dfrac{75}{2}}$ $\dfrac{\sqrt{75}}{\sqrt{2}}=\dfrac{5\sqrt{3}}{\sqrt{2}}\cdot\dfrac{\sqrt{2}}{\sqrt{2}}=\dfrac{5\sqrt{6}}{2}$ $\dfrac{-5}{1}\pm\dfrac{5\sqrt{6}}{2}$ $\boxed{\dfrac{-10\pm5\sqrt{6}}{2}}$

21. $3\pm\sqrt{\dfrac{32}{5}}$ $\dfrac{\sqrt{32}}{\sqrt{5}}=\dfrac{4\sqrt{2}}{\sqrt{5}}\cdot\dfrac{\sqrt{5}}{\sqrt{5}}=\dfrac{4\sqrt{10}}{5}$ $\dfrac{3}{1}\pm\dfrac{4\sqrt{10}}{5}$ $\boxed{\dfrac{15\pm4\sqrt{10}}{5}}$

Part IV: Simplifying Answers:

Some answers will need to be simplified. This involves using the skills you have used above.

Example: $\dfrac{2\pm\sqrt{12}}{4}$ Common error .... $\dfrac{1\pm\sqrt{12}}{2}=\dfrac{1\pm2\sqrt{3}}{2}$

Proper solution... $\dfrac{2\pm\sqrt{12}}{4}=\dfrac{2\pm2\sqrt{3}}{4}=\dfrac{1\pm\sqrt{3}}{2}$

Simplify the following radicals.

22. $\dfrac{2\pm\sqrt{32}}{6}$ $\dfrac{2\pm4\sqrt{2}}{6}$ $\boxed{\dfrac{1\pm2\sqrt{2}}{3}}$

23. $\dfrac{5\pm\sqrt{50}}{15}$ $\dfrac{5\pm5\sqrt{2}}{15}$ $\boxed{\dfrac{1\pm\sqrt{2}}{3}}$

24. $\dfrac{3\pm2\sqrt{18}}{9}$ $\dfrac{3\pm6\sqrt{2}}{9}$ $\boxed{\dfrac{1\pm2\sqrt{2}}{3}}$

25. $\dfrac{7\pm\sqrt{21}}{7}$ Since $\sqrt{21}$ can not be simplified, then this fraction is simplified $\boxed{\dfrac{7\pm\sqrt{21}}{7}}$

26. $\dfrac{4\pm\sqrt{12}}{8}$ $\dfrac{4\pm2\sqrt{3}}{8}$ $\boxed{\dfrac{2\pm\sqrt{3}}{4}}$

27. $\dfrac{18\pm3\sqrt{18}}{18}$ $\dfrac{18\pm9\sqrt{2}}{18}$ $\boxed{\dfrac{2\pm\sqrt{2}}{2}}$