ESPRESSIONI NUMERICHE e PROPRIETÀ DELLE POTENZE

1. $\left(-1-\frac{1}{2}\right)^3\left\{-\frac{1}{3^2}+\left[\left(-\frac{1}{6}\right):\left(-\frac{7}{6}\right)+\frac{6}{7}:\left(\frac{1}{2}-1\right)-\frac{3}{7}\right]\cdot 2^{-1}\right\}=$

$=\left(-\frac{3}{2}\right)^3\left\{-\frac{1}{3^2}+\left[\frac{1}{7}+\frac{6}{7}:\left(-\frac{1}{2}\right)-\frac{3}{7}\right]\cdot 2^{-1}\right\}=$

$=\left(-\frac{3}{2}\right)^3\left\{-\frac{1}{3^2}+\left[\frac{1}{7}-\frac{12}{7}-\frac{3}{7}\right]\cdot 2^{-1}\right\}=\left(-\frac{3}{2}\right)^3\left\{-\frac{1}{3^2}-2\cdot\frac{1}{2}\right\}=\left(-\frac{3}{2}\right)^3\left\{-\frac{1}{9}-1\right\}=$

$=\left(-\frac{3}{2}\right)^3\left\{\frac{-1-9}{9}\right\}==\left(-\frac{3}{2}\right)^3\left\{-\frac{10}{9}\right\}=-\frac{3^3}{8}\cdot\left(-\frac{10}{3^2}\right)=\frac{15}{4}$

2. $-2^{-2}\left\{\left[\left(1{,}2-\frac{3}{4}\right)\left(0{,}8+\frac{1}{5}\right)-\frac{1}{3}:\left(\frac{7}{6}-\frac{3}{4}\right)\right]:\left(\frac{3}{5}+\frac{1}{3}\right)+(-2)^{-3}\right\}-\left(-\frac{4}{3}\right)^{-2}=$

$=-2^{-2}\left\{\left[\left(\frac{9}{20}\right)(+1)-\frac{1}{3}:\left(\frac{5}{12}\right)\right]:\left(\frac{14}{15}\right)-\frac{1}{8}\right\}-\left(-\frac{3}{4}\right)^2=$

$=-\frac{1}{4}\left\{\left[\frac{9}{20}-\frac{4}{5}\right]\cdot\frac{15}{14}-\frac{1}{8}\right\}-\frac{9}{16}=-\frac{1}{4}\left\{-\frac{7}{20}\cdot\frac{15}{14}-\frac{1}{8}\right\}-\frac{9}{16}=-\frac{1}{4}\left(-\frac{1}{2}\right)-\frac{9}{16}=-\frac{7}{16}$

3. $\left\{\left[\left(-\frac{1}{3}\right)^{-3}\right]^4\left[\left(-\frac{1}{3}\right)^{-4}\right]^{-2}+(-3)^2\right\}:\left[-5\cdot(-3)^2\right]+\left[(-2)^3\right]^{-1}+\frac{1}{8}=$

$=\left\{\left(-\frac{1}{3}\right)^{-12}\left(-\frac{1}{3}\right)^8+9\right\}:\left[-5\cdot 9\right]-\frac{1}{8}+\frac{1}{8}=\left\{\left(-\frac{1}{3}\right)^{-4}+9\right\}:(-45)=90:(-45)=-2$

4. $\left[\frac{3}{5}+\left(-\frac{2}{3}\right)\left(1-\frac{4}{10}\right)\right]:\left[\frac{1}{5}-\frac{1}{10}\left(-\frac{2}{3}\right):\left(-\frac{1}{3}\right)^2\right]=$

$=\left[\frac{3}{5}-\frac{2}{3}\left(\frac{3}{5}\right)\right]:\left[\frac{1}{5}+\frac{1}{15}:\frac{1}{9}\right]=\left[\frac{3}{5}-\frac{2}{5}\right]:\left[\frac{1}{5}+\frac{3}{5}\right]=\frac{1}{5}\cdot\frac{5}{4}=\frac{1}{4}$

5. $\left(\frac{1}{6}-\frac{2}{3}+\frac{1}{4}\right):\left[\frac{1}{3}-\frac{5}{6}-\left(-\frac{1}{2}\right)^2\right]-\left(1-\frac{1}{3}\right)^2:\left(1+\frac{1}{3}\right)^2=$

$=-\frac{1}{4}:\left[\frac{1}{3}-\frac{5}{6}-\frac{1}{4}\right]-\left(\frac{2}{3}\right)^2:\left(\frac{4}{3}\right)^2=-\frac{1}{4}\cdot\left(-\frac{4}{3}\right)-\left(\frac{1}{2}\right)^2=\frac{1}{3}-\frac{1}{4}=\frac{1}{12}$

6. $\left[\frac{2}{5}:\frac{1}{2}\cdot\left(-\frac{5}{2}\right)^{2}+1\right]\cdot\left(-\frac{1}{2}-\frac{2}{3}\right)\cdot\left(-2-\frac{1}{3}\right)^{-2}=$

$=\left[\frac{2}{5}\cdot 2\cdot\frac{5^{2}}{2^{2}}+1\right]\cdot\left(-\frac{7}{6}\right)\cdot\left(-\frac{7}{3}\right)^{-2}=[5+1]\cdot\left(-\frac{7}{6}\right)\cdot\frac{3^{2}}{7^{2}}=-7\cdot\frac{3^{2}}{7^{2}}=-\frac{9}{7}$

7. $\left[\left(-\frac{3}{4}\right)^{2}\right]^{3}\cdot\left(\frac{1}{4}-1\right)^{5}:\left[\left(-\frac{3}{4}\right)^{5}\right]^{2}+\{2^{5}:(2^{-3}\cdot 2^{6})\}^{-2}\cdot\left[\left(-\frac{1}{3}\right)^{-2}\right]^{2}=$

$=\left(-\frac{3}{4}\right)^{6}\cdot\left(-\frac{3}{4}\right)^{5}:\left(-\frac{3}{4}\right)^{10}+\{2^{5}:2^{3}\}^{-2}\cdot\left(-\frac{1}{3}\right)^{-4}=$

$=-\frac{3}{4}+\{2^{2}\}^{-2}\cdot 3^{4}=-\frac{3}{4}+\frac{81}{16}=\frac{69}{16}$

8. $\frac{\frac{7}{2}-\left(-\frac{1}{14}\right)\left(2-\frac{3}{5}\right)-\frac{28}{3}}{-\frac{2}{5}-2+(-2)\left(-\frac{1}{6}\right)}-(-2)^{3}\cdot\left(1-\frac{34}{31}\right)=$

$=\frac{\frac{7}{2}+\frac{1}{14}\left(\frac{7}{5}\right)-\frac{28}{3}}{-\frac{2}{5}-2+\frac{1}{3}}+8\cdot\left(-\frac{3}{31}\right)=\frac{\frac{7}{2}+\frac{1}{10}-\frac{28}{3}}{-\frac{2}{5}-2+\frac{1}{3}}-\frac{24}{31}=\frac{\frac{7}{2}+\frac{1}{10}-\frac{28}{3}}{-\frac{2}{5}-2+\frac{1}{3}}-\frac{24}{31}=-\frac{86}{15}:\left(-\frac{31}{15}\right)-\frac{24}{31}=2$

9. $\frac{1}{5}:\left[\frac{1}{2}\cdot\left(-\frac{2}{5}\right)^{2}\right]-\left[-\frac{1}{2}+\left(-2-\frac{1}{2}\right)^{-1}\right]=$

$=\frac{1}{5}:\left[\frac{2}{25}\right]-\left[-\frac{1}{2}-\frac{2}{5}\right]=\frac{5}{2}+\frac{9}{10}=\frac{17}{5}$

10. $\left[\frac{-\frac{1}{2}-\frac{3}{4}}{-3+\frac{3}{4}}+\frac{-\frac{1}{2}-\frac{3}{5}}{-3+\left(-\frac{1}{2}\right)^{2}}\right]\left(-1-\frac{1}{2}\right)^{2}=$

$=\left[\frac{-\frac{5}{4}}{-\frac{9}{4}}+\frac{-\frac{11}{10}}{-\frac{11}{4}}\right]\left(-\frac{3}{2}\right)^{2}=\left[\frac{5}{9}+\frac{2}{5}\right]\left(-\frac{3}{2}\right)^{2}=\frac{43}{45}\cdot\frac{9}{4}=\frac{43}{20}$

11. $$\frac{\left(-\frac{4}{3}\right)^{-2}\left(3+\frac{1}{2^{-2}}\right)}{-\left(-\frac{1}{2}\right)^{2}+5-\frac{2}{3}}+\frac{1}{2}\cdot\left(-2-\frac{1}{3}\right)^{-1}=$$

$$=\frac{\left(\frac{3}{4}\right)^{2}(3+4)}{-\frac{1}{4}+5-\frac{2}{3}}+\frac{1}{2}\cdot\left(-\frac{3}{7}\right)=\frac{\frac{63}{16}}{\frac{49}{12}}-\frac{3}{14}=\frac{27}{28}-\frac{3}{14}=\frac{3}{4}$$

12. $$\frac{-\frac{4}{3}+\frac{1}{3}:\left(-\frac{1}{2}\right)^{3}}{-2+\frac{1}{3}}-\frac{-\frac{3}{2}+(+2)^{-3}\left(1+\frac{1}{3}\right)}{\left(-\frac{7}{12}\right)^{2}\cdot\left(-\frac{5}{7}\right)}+\frac{108}{35}=$$

$$=\frac{-\frac{4}{3}-\frac{8}{3}}{-\frac{5}{3}}-\frac{-\frac{3}{2}+\frac{1}{8}\left(\frac{4}{3}\right)}{\left(\frac{7^{2}}{144}\right)\cdot\left(-\frac{5}{7}\right)}+\frac{108}{35}=4\cdot\frac{3}{5}-\frac{-\frac{4}{3}}{-\frac{35}{144}}+\frac{108}{35}=\frac{12}{5}-\frac{192}{35}+\frac{108}{35}=\frac{12}{5}-\frac{12}{5}=0$$

13. $$\frac{-\left(2-\frac{1}{2}\right)^{-3}-\left[\frac{2}{3}\left(1-\frac{1}{4}\right)\left(1+\frac{1}{5}\right)\right]^{-1}}{\left\{-2^{3}\left[1-\left(-\frac{1}{2}\right)^{2}-\left(1+\frac{1}{2}\right)^{2}\right]-9\right\}^{-3}}=$$

$$=\frac{-\left(\frac{3}{2}\right)^{-3}-\left[\frac{2}{3}\left(\frac{3}{4}\right)\left(\frac{6}{5}\right)\right]^{-1}}{\left\{-2^{3}\left[1-\frac{1}{4}-\frac{9}{4}\right]-9\right\}^{-3}}=\frac{-\frac{8}{27}-\frac{5}{3}}{\left\{-2^{3}\left[-\frac{3}{2}\right]-9\right\}^{-3}}=\frac{-\frac{53}{27}}{\{+12-9\}^{-3}}=-\frac{53}{27}:3^{-3}=53$$

14. $$-2^{2}-\frac{\left(1+\frac{2}{3}\right)[3+(-2)^{-2}]:\left(3-\frac{2}{5}\right)}{\left[\left(-\frac{5}{2}\right)^{2}\right]^{-3}:\left[\left(-\frac{2}{5}\right)^{2}\left(-\frac{2}{5}\right)^{3}\right]}=$$

$$=-2^{2}-\frac{\left(\frac{5}{3}\right)\frac{13}{4}:\left(\frac{13}{5}\right)}{\left(-\frac{2}{5}\right)^{6}:\left[\left(-\frac{2}{5}\right)^{5}\right]}=-2^{2}-\frac{\frac{25}{12}}{-\frac{2}{5}}=-4+\frac{125}{24}=\frac{29}{24}$$

15. $\dfrac{(-3)^4:(-3)^3+2^{-1}:2}{(-3)^9:(-3)^8+2^{-1}}+\dfrac{-3^3:(-3)^2+3:3^{-1}+1}{[-(-2)^{-2}:(-2)^3]^{-1}}-\left(\dfrac{32}{7}\right)^{-1}=$

$=\dfrac{-3+\dfrac{1}{4}}{-3+\dfrac{1}{2}}+\dfrac{-3+9+1}{[-(-2)^{-5}]^{-1}}-\dfrac{7}{32}=-\dfrac{11}{4}:\left(-\dfrac{5}{2}\right)+\dfrac{7}{32}-\dfrac{7}{32}=+\dfrac{11}{10}$

16. $\dfrac{-4\left(-\dfrac{2}{3}\right)^{-2}\cdot\left[\left(\dfrac{1}{5}-\dfrac{1}{6}\right):\left(\dfrac{7}{30}-\dfrac{5}{12}\right)-\left(\dfrac{5}{3}-\dfrac{3}{2}\right):\left(-\dfrac{3}{2}\right)\right]}{\left(\dfrac{3}{5}-\dfrac{1}{3}\right)\left(\dfrac{1}{4}-1\right)-\left[-2^2\left(3-\dfrac{1}{2}\right)+2\left(3+\dfrac{1}{2}\right)\right]}=$

$=\dfrac{-4\left(\dfrac{9}{4}\right)\cdot\left[\left(\dfrac{1}{30}\right):\left(-\dfrac{11}{60}\right)-\left(\dfrac{1}{6}\right)\cdot\left(-\dfrac{2}{3}\right)\right]}{\left(\dfrac{4}{15}\right)\left(-\dfrac{3}{4}\right)-\left[-4\left(\dfrac{5}{2}\right)+2\left(\dfrac{7}{2}\right)\right]}=\dfrac{-9\cdot\left[-\dfrac{2}{11}+\dfrac{1}{9}\right]}{-\dfrac{1}{5}-[-10+7]}=\dfrac{-9\cdot\left(-\dfrac{7}{99}\right)}{-\dfrac{1}{5}+3}=\dfrac{7}{11}:\dfrac{14}{5}=\dfrac{5}{22}$

17. $\left(1+\dfrac{1}{-\dfrac{3}{4}-1}\right)\cdot\dfrac{-\dfrac{3}{4}-1}{2\left(-\dfrac{3}{4}\right)}=\left(1-\dfrac{4}{7}\right)\cdot\left(-\dfrac{7}{4}\right):\left(-\dfrac{3}{2}\right)=\dfrac{3}{7}\cdot\dfrac{7}{6}=\dfrac{1}{2}$

18. $[1+(-1)^{-1}]:\left(1-\dfrac{-1+1}{-1}\right)=0:1=0$

19. $\left(1-\dfrac{3}{11}\right):\left(1-\dfrac{-\dfrac{11}{3}+1}{-\dfrac{11}{3}}\right)=\dfrac{8}{11}:\left(1-\dfrac{8}{3}:\dfrac{11}{3}\right)=\dfrac{8}{11}:\dfrac{3}{11}=\dfrac{8}{3}$

20. $\dfrac{2-\dfrac{1}{-\dfrac{2}{3}+1}}{2+\dfrac{5}{-\dfrac{2}{3}-2}}-\left[\dfrac{\left(-\dfrac{2}{3}\right)^2+1}{\left(-\dfrac{2}{3}+1\right)^2}-\dfrac{2}{-\dfrac{2}{3}+1}\right]=\dfrac{2-3}{2-\dfrac{15}{8}}-\left[\dfrac{\dfrac{4}{9}+1}{\dfrac{1}{9}}-\dfrac{2}{\dfrac{1}{3}}\right]=-1:\dfrac{1}{8}-(13-6)=-8-7=-15$