

1. Simplify:

(a)  $(3^2 + 2^2) \times \left(\frac{1}{2}\right)^3$   $\left(\frac{13}{8}\right)$

(b)  $\left[\left(\frac{1}{3}\right)^{-3} - \left(\frac{1}{2}\right)^{-3}\right] \div \left(\frac{1}{4}\right)^{-3}$   $\left(\frac{19}{64}\right)$

(c)  $(2^2 + 3^2 - 4^2) \div \left(\frac{3}{2}\right)^2$   $\left(-\frac{4}{3}\right)$

(d)  $(4^{-1} - 5^{-1}) \div 3^{-1}$   $\left(\frac{1}{60}\right)$

2. Simplify and give the answer in exponential form:

(a)  $(2^5 \div 2^8)^5 \times 2^{-5}$   $(2^{-20})$

(b)  $(-4)^3 \times (5)^3 \times (-5)^{-3}$   $(100)^{-3}$

(c)  $\frac{1}{8} \times (3)^{-3}$   $(6^{-3})$

(d)  $9^3 \div 3^5$   $(3^1)$

(e)  $(2^3)^2 \div 2^2$   $(2^4)$

(f)  $4^3 \times 2^4 \div 8^2$   $(2^4)$

(g)  $5^3 \div 25$   $(5^1)$

3. Simplify using laws of exponents:

(a)  $\frac{(2^5)^2 \times 7^3}{8^3 \times 7}$  (98)

(d)  $\frac{2 \times 9^{-1} \times 4^{-2}}{3^{-4} \times 2^{-5}}$  (36)

(b)  $\frac{25 \times 5^2 \times t^8}{10^3 \times t^4}$   $\left(\frac{5t^4}{8}\right)$

(e)  $\frac{12^4 \times 27^{-1} \times 8^{-2}}{9^{-3} \times 6^3 \times 4^{-1}}$  (162)

(c)  $\frac{5^{-7} \times 6^{-5}}{3^{-5} \times 10^{-5} \times 25^{-1}}$  (1)

(f)  $\frac{(-3)^{-4} \times (-2)^6 \times 7^4}{45 \times (-49)^2 \times 9^{-2}}$   $\left(\frac{1}{16}\right)$

4. (a) Express  $4^{-3}$  as a power with base 2.  $(2^{-6})$   
 (b) Write exponential form for  $8 \times 8 \times 8$  taking base as 2.  $(2^9)$

5. Find the value of the variable:

(a)  $(2p)^m \div 8p^3 = 1$   $(m=3)$

(b)  $3^{3x+3} = 9^{x+4}$   $(x=-5)$

(c)  $16^{2m} = 4^{3m+4}$   $(m=4)$

(d)  $7^{m-5} = 1$   $(m=5)$

(e)  $10^{-5} \times 100000 = 100^m$   $(m=0)$

(f)  $\left\{ \left( \frac{2}{5} \right)^{2m} \right\}^{-2} = \frac{16}{625}$   $(m=-1)$

(g)  $\left( \frac{1}{2} \right)^{-5p} \div \left( \frac{1}{2} \right)^{3p} = \left( \frac{1}{2} \right)^{24}$   $(p=-3)$

(h)  $\left( \frac{1}{4} \right)^{-4} \times \left( \frac{1}{4} \right)^{-8} = \left( \frac{1}{4} \right)^{-4x}$   $(x=3)$

(i)  $\left( -\frac{1}{2} \right)^{-9} \div \left( -\frac{1}{2} \right)^8 = \left( -\frac{1}{2} \right)^{-2x+1}$   $(x=14)$

(j)  $\left( \frac{8}{3} \right)^{2x+1} \times \left( \frac{8}{3} \right)^5 = \left( \frac{8}{3} \right)^{x+2}$   $(x=-4)$

6. The size of a Red Blood cell is  $0.000007 \text{ m}$  and the size of a plant cell is  $0.00001275 \text{ m}$ . What fraction of the size of the plant cell is the size of the Red Blood cell?  $\left( \frac{7}{13} \approx \frac{1}{2} \right)$

7. The mass of the Earth is approximately  $5.97 \times 10^{24} \text{ kg}$  and that of the moon is approximately  $7.35 \times 10^{22} \text{ kg}$ . Find the difference in their masses.  $(5.8965 \times 10^{24} \text{ kg})$

8. The distance between the sun and the Earth is  $1.496 \times 10^{11}$  m and the distance between the Earth and moon is  $3.84 \times 10^8$  m. During solar eclipse moon comes between the Earth and the sun. At that time, what is the distance between moon and the sun?  $(1.49216 \times 10^{11} \text{ m})$

9. Evaluate:  
 (a)  $1.2 \times 10^{16} + 4.2 \times 10^{15} - 1.6 \times 10^{14}$   $(1.604 \times 10^{16})$   
 (b)  $3^{45} \times 3^{25} - 3^{28} \times 3^{42}$   $(0)$

10. (a) By what number should  $4^{-1}$  be multiplied so that the product is  $(-5)^{-1}$ ?  $(-\frac{4}{5})$   
 (b) By what number should  $(-\frac{2}{3})^{-3}$  be divided so that the quotient is  $(\frac{9}{8})^2$ ?  $(-\frac{8}{3})$

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