Consolidation Questions

Key words: algebraic, BIDMAS, evaluate, expand, expression, factorise, index, LCM, numerical Pascal's triangle, rearrange, simplify, term, transpose.

LO 1.2.1 Apply the laws of indices to algebraic and numerical terms

1. Evaluate the following, expressing your final answer in exact form,

(a) $2^3 =$ ______ (b) $16^{1/2} =$ ______ (c) $6^0 =$ ______

(d) $4^{-1} =$ ______ (e) $8^{2/3} =$ ______ (f) $5^{-2} =$ ______

(g) $49^{-1/2} =$ ______ (h) $9^{-3/2} =$ ______ (i) $\left(1/4\right)^{-1/2} =$ ______

2. Simplify the following, giving your final answer in exact form,

(a) $2^4 \times 2^3 =$ ________ (b) $3^{-4} \times 3^9 =$ ________

(c) $4^{-2} \times 4^{-6} =$ ________ (d) $7^2 \times 7^{-3} \times 7^4 =$ ________

(e) $5^{10} \div 5^3 =$ ________ (f) $2^3 \div 2^{-3} =$ ________

(g) $6^{-2} \div 6^{-3} =$ ________ (h) $8^{-2} \div 8^3 =$ ________

(i) $\left(2^3\right)^2 =$ ________ (j) $\left(3^4\right)^{-3} =$ ________

3. Simplify the following leaving your answer as a power,

a. $(r^6)^{\frac{1}{3}}$

b. $c^{-3}d^2 \times c^{-3}d^{-4}$

c. $(16^{-4})^{-\frac{1}{4}}$

d. $(t^{32})^{-\frac{1}{4}}$

e. $\dfrac{r^5s^4}{r^3s^{-7}}$

f. $(p^{-3}r^4t^5)^3$

4. Challenge question: Simplify the following expression and eliminate the negative exponent(s),

$$\left(\frac{q^{-1}r^{-1}s^{-2}}{r^{-5}sq^{-8}}\right)^{-1} \times \frac{(qr^2s^3)^4}{(q^2r^2s\ )^3} \times \frac{5qr^{-2}}{q^{-1}r^{-3}}$$

LO 1.2.2 Add, subtract and multiply algebraic expressions

5. Expand and simplify the following expressions,

a. $(3x + 4y) + (2x - 5y)$

b. $(3x + 4y) - (2x - 5y)$

c. $(3x + 4y)(2x - 5y)$

d. $4x(2x^2 - 3x + 5)$

e. $(3x - 2)(2x^2 - 3x + 5)$

f. $(2x^2 - 3x - 2)(2x^2 - 3x + 5)$

g. $(3x - 2)(2x^2 - 3x + 5)$

h. $(4x - 3y)(2y^2 - 3xy + 5x)$

i. $(3y^2 - xy + 3yx^2)(5y^2 + 2xy - x^2)$

j. $(3a^2 - bc + 2ac^2)(b^2 - 4ac - a^2)$

LO 1.2.3 Evaluate algebraic expressions

6. Given $f(x, y) = (3y^2 - xy + 3yx^2)(5y^2 + 2xy - x^2)$ evaluate the following

a. $f(0, 1)$

b. $f(-1, 1)$

c. $f\left(-2, \frac{1}{2}\right)$

d. $f\left(-\frac{1}{3}, \frac{1}{4}\right)$

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LO 1.2.4 Manipulate algebraic fractions

7. Express the following as a single fraction in its simplest form

a. $\frac{2x}{3} - \frac{3x}{8}$

b. $\frac{3}{x} - \frac{3x}{2}$

c. $\frac{1}{3x} + \frac{4}{2x^2}$

d. $\frac{pq}{r} - \frac{pr}{q} + \frac{2qr}{p}$

e. $\frac{2x}{z} - \frac{3y}{z^2}$

f. $\frac{2}{t} - \frac{3}{3-t}$

g. $\frac{2x}{1-x} - \frac{x}{x-3}$

h. $\frac{t+1}{t-1} - \frac{3t+2}{2t+3}$

i. $\frac{2}{p-1} + \frac{3}{2p-1} - \frac{1}{p^2+1}$

LO 1.2.5 Rearrange (transpose) formulae

8. Transpose the following formulae to make x the subject,

a. $h = dx + f$

b. $a^2 + g = x + g$

c. $k = d + mx$

d. $x^2 + 9 = z$

e. $g + h = x - h$

f. $2x^2 + 6 = h$

g. $3(x + 2) = d$

h. $2k + x^2 = j + k$

i. $d(x - f) = w$

j. $m^2 + x^2 = dh$

k. $\frac{1}{kx} - 3 + \frac{2}{3x} = -k$

l. $\frac{1}{p} - \frac{2}{q} + \frac{3}{x} = r$