



CAMI Mathematics: Grade 10

GRADE 10 CAPS Curriculum

10.4 Exponents

1.1 Simplify the following by using the exponential laws.

(a) $(3z^6)^2$

(b) $2e^2m^4 \times 5e^3m^3$

(c) $(-3x^3)^2 \times (-2x^3)^2$

(d) $(5p^2)^0$

(e) $\left(\frac{1}{3} q^8y^2\right)^4$

(f) $-\left(-\frac{1}{4} a^3b^2\right)^3$

(g) $\frac{7^3 m^{-3}}{7^{-1} m^6}$

(h) $\left(\frac{2^3 e^{-3}}{y^3 p^{-3}}\right)^{-2}$

(i) $36^{3x+4} \times 18^{4x}$

(j) $25^{4b+5} \times 25^{3b}$

1.2 Simplify the following surds.

(a) $\sqrt[4]{6} \times \sqrt[4]{4}$

(b) $(\sqrt[5]{5})^{20}$

(c) $(\sqrt{10} \times \sqrt{2})^4$

(d) $(\sqrt[3]{9})^9$

1.3 Solve exponential equations.

(a) $25^x = 1$

(b) $81^d = 27$

(c) $2.32^w = 4$

(d) $5.125^z - 3125 = 0$

(e) $8^y \times 2^{y-1} = 1$

(f) $49^{a-1} \times 7^{a+1} = 1$

(g) $7^h - 7^{h-3} = 342$

(h) $5^v + 5^{v-4} = 626$

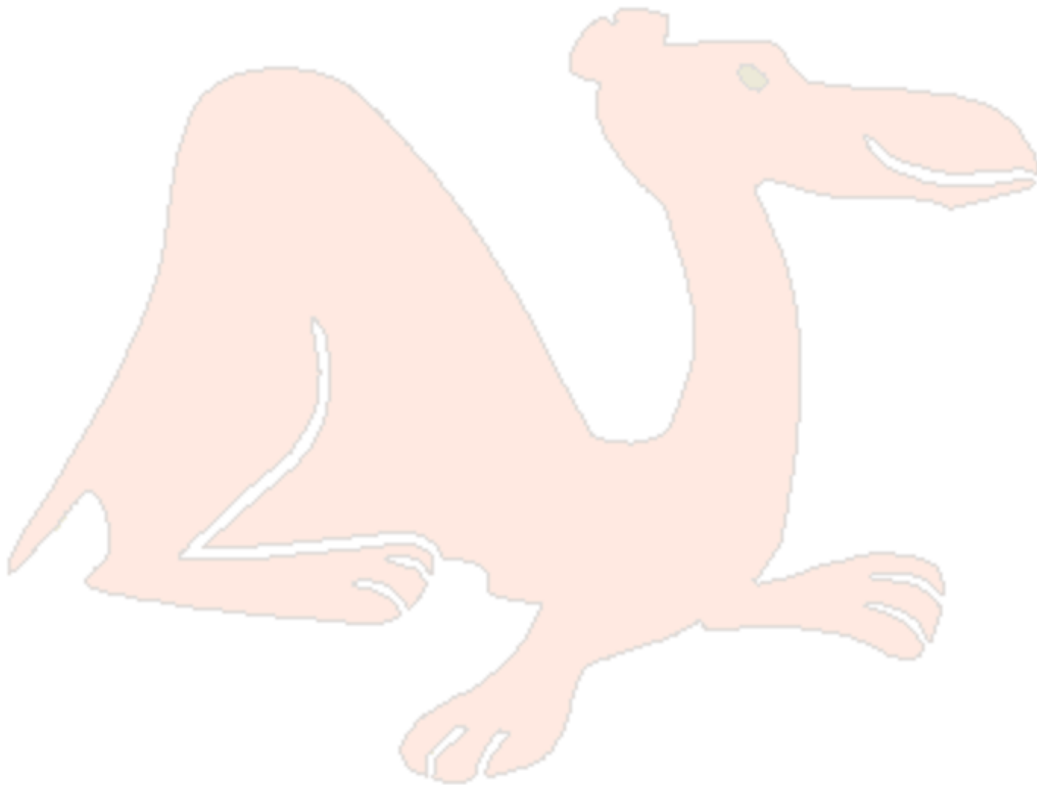
(i) $8x^{\frac{1}{3}} = 16$



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(j) $y^{\frac{-3}{4}} = 125$

(k) $z - 12z^{\frac{1}{2}} + 32 = 0$





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MEMO

1.1 Simplify the following by using the exponential laws.

[4.3.1.3; 4.3.1.8; 4.3.2.1; 4.3.2.3; 4.3.3.1; 4.3.3.2]

(a) $(3z^6)^2 = 9z^{12}$

(b) $2e^2m^4 \times 5e^3m^3 = 10e^5m^7$

(c) $(-3x^3)^2 \times (-2x^3)^2$
 $= 9x^6 \times 4x^6$
 $= 36x^{12}$

(d) $(5p^2)^0 = 1$

(e) $(\frac{1}{3} q^8y^2)^4 = \frac{1}{81} q^{32}y^8$

(f) $-(-\frac{1}{4} a^3b^2)^3 - 6$
 $= -(-\frac{1}{64} a^9b^6)$
 $= \frac{1}{64} a^9b^6$

(g) $\frac{7^3 m^{-3}}{7^{-1} m^6}$
 $= 7^4 m^{-9}$
 $= \frac{7^4}{m^9}$

(h) $(\frac{2^3 e^{-3}}{y^3 p^{-3}})^{-2}$
 $= \frac{2^{-6} e^6}{y^{-6} p^6}$
 $= \frac{e^6 y^6}{2^6 p^6}$



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$$\begin{aligned} \text{(i)} \quad & 36^{3x+4} \times 18^{4x} \\ & = (2^2 \cdot 3^2)^{3x+4} \times (2 \cdot 3^2)^{4x} \\ & = 2^{6x+8} \cdot 3^{6x+8} \times 2^{4x} \cdot 3^{8x} \\ & = 2^{10x+8} \cdot 3^{14x+8} \end{aligned}$$

$$\begin{aligned} \text{(j)} \quad & 25^{4b+5} \times 25^{3b} \\ & = (5^2)^{4b+5} \times (5^2)^{3b} \\ & = 5^{8b+10} \times 5^{6b} \\ & = 5^{14b+10} \end{aligned}$$

1.2 Simplify the following surds. [4.3.5.6]

$$\text{(a)} \quad \sqrt[4]{6} \times \sqrt[4]{4} = \sqrt[4]{6 \times 4} = \sqrt[4]{24}$$

$$\text{(b)} \quad (\sqrt[3]{5})^{20} = (5^{\frac{1}{3}})^{20} = 5^4$$

$$\text{(c)} \quad (\sqrt{10} \times \sqrt{2})^4 = (\sqrt{10 \times 2})^4 = (20^{\frac{1}{2}})^4 = 20^2$$

$$\text{(d)} \quad (\sqrt[3]{9})^9 = (9^{\frac{1}{3}})^9 = 9^3$$

1.3 Solve exponential equations. [4.9.1.1; 4.9.1.2; 4.9.1.3; 4.9.1.4; 4.9.2.1]

$$\begin{aligned} \text{(a)} \quad & 25^x = 1 \\ & (5^2)^x = 5^0 \\ & 5^{2x} = 5^0 \\ & 2x = 0 \\ & x = 0 \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad & 81^d = 27 \\ & (3^4)^d = 3^3 \\ & 3^{4d} = 3^3 \\ & 4d = 3 \\ & d = \frac{3}{4} \end{aligned}$$

$$\begin{aligned} \text{(c)} \quad & 2 \cdot 32^w = 4 \\ & 2 \cdot 2^{5w} = 2^2 \\ & 2^{1+5w} = 2^2 \\ & 1 + 5w = 2 \\ & 5w = 1 \\ & w = \frac{1}{5} \end{aligned}$$



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(d) $5 \cdot 125^z - 3125 = 0$
 $5 \cdot 125^z = 3125$
 $125^z = 625$
 $5^{3z} = 5^4$
 $3z = 4$
 $z = \frac{4}{3}$

(e) $8^y \times 2^{y-1} = 1$
 $2^{3y} \times 2^{y-1} = 2^0$
 $2^{4y-1} = 2^0$
 $4y - 1 = 0$
 $4y = 1$
 $y = \frac{1}{4}$

(f) $49^{a-1} \times 7^{a+1} = 1$
 $(7^2)^{a-1} \times 7^{a+1} = 7^0$
 $7^{2a-2} \times 7^{a+1} = 7^0$
 $7^{3a-1} = 7^0$
 $3a - 1 = 0$
 $3a = 1$
 $a = \frac{1}{3}$

(g) $7^h - 7^{h-3} = 342$
 $7^h - 7^h \cdot 7^{-3} = 342$
 $7^h(1 - 7^{-3}) = 342$
 $7^h(1 - \frac{1}{343}) = 342$
 $7^h \cdot \frac{342}{343} = 342$
 $7^h = 343$
 $7^h = 7^3$
 $h = 3$

(h) $5^v + 5^{v-4} = 626$
 $5^v + 5^v \cdot 5^{-4} = 626$
 $5^v(1 + 5^{-4}) = 626$
 $5^v(1 + \frac{1}{625}) = 626$
 $5^v(\frac{626}{625}) = 626$



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$$5^v = 625$$

$$5^v = 5^4$$

$$v = 4$$

(i)

$$8x^{\frac{1}{3}} = 16$$

$$x^{\frac{1}{3}} = 2$$

$$(x^{\frac{1}{3}})^3 = (2)^3$$

$$x = 8$$

(j)

$$y^{\frac{-3}{4}} = 125$$

$$(y^{\frac{-3}{4}})^{\frac{-4}{3}} = (5^3)^{\frac{-4}{3}}$$

$$y = 5^{-4}$$

$$y = \frac{1}{625}$$

(k)

$$z - 12z^{\frac{1}{2}} + 32 = 0$$

$$(z^{\frac{1}{2}} - 8)(z^{\frac{1}{2}} - 4) = 0$$

$$z^{\frac{1}{2}} = 8; z^{\frac{1}{2}} = 4$$

$$z = 64; z = 16$$