

1<sup>st</sup> TERM GENERAL EXAM

**Remember:** in each question, write the steps you have taken to reach the solution. (1 point each question)

1) Work out and simplify:

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

$$b) \frac{5}{12} - 5 + \frac{1}{3} - \frac{5}{6} \div \frac{1}{2} =$$

2) Write each of the following expressions as a single positive power:

$$a) \frac{a^4 \cdot b^2 \cdot b^5}{b^4(a^{-2})^{-2}} =$$

$$b) \frac{5^{-6} \cdot 4}{(-2)^2 \cdot 10^{-3}} =$$

3) A boy gave his cousin  $\frac{1}{6}$  of his Halloween candy, he ate  $\frac{1}{4}$  of the candy, and saved 35 pieces of candy. How many pieces of candy did he start with?

4) Complete:

Decimal notation	Standard form	Standard form with 4 s.f.
2710558		
0.000352839		
	$3.4208 \times 10^8$	
	$1.94307 \times 10^{-5}$	

5) Complete:

$\sqrt{-\frac{1}{4}} =$	$\sqrt{\frac{1}{4}} =$	$\sqrt[3]{-8} =$
$\sqrt[3]{(-2)^3} =$	$(-2)^{-2} =$	$-2^4 =$

6) Work out (expressing each number as a fraction) and write the solution in decimal notation:  $1.30\overline{5} - 1.\overline{8}$

7) A restaurant paid 112€ for a coffee machine after having been given a 20% discount. What was the original price of the coffee machine?

8) Factor the polynomials:

$$a) 4x^3y + 4x^2y + xy =$$

$$b) 18m^2n^3 - 50n^3 =$$

9) Work out:

$$a) x(x-3)^2 - 3x(x+1)(x-1) + 6x^2 =$$

$$b) (x^2 - 5x + 6)(x^2 - x) =$$

10) Work out and simplify:

$$a) \frac{x^2 - 1}{x^2 - 2x + 1} \cdot \frac{2x - 2}{(x+1)^2} =$$

$$b) \frac{x^2 - 4}{8x^2 + 16x} \div \frac{x - 2}{4x^3} =$$

**SOLUTION**

1) Work out and simplify:

$$\begin{aligned} \text{a) } \frac{-3}{4} \cdot \left(1 - \frac{2}{3} + \frac{3}{2}\right) - \left(\frac{1}{2}\right)^2 &= \frac{-3}{4} \cdot \left(\frac{6-4+9}{6}\right) - \frac{1}{4} = \frac{-3}{4} \cdot \frac{11}{6} - \frac{1}{4} = \\ &= \frac{-11}{8} - \frac{1}{4} = \frac{-11}{8} - \frac{2}{8} = \frac{-13}{8} \end{aligned}$$

$$\text{b) } \frac{5}{12} - 5 + \frac{1}{3} - \frac{5}{6} \div \frac{1}{2} = \frac{5}{12} - 5 + \frac{1}{3} - \frac{5}{3} = \frac{5}{12} - \frac{60}{12} + \frac{4}{12} - \frac{20}{12} = \frac{-71}{12}$$

2) Write each of the following expressions as a single positive power:

$$\text{a) } \frac{a^4 \cdot b^2 \cdot b^5}{b^4(a^{-2})^{-2}} = \frac{a^4 \cdot b^7}{b^4 \cdot a^4} = \frac{b^7}{b^4} = b^3$$

$$\text{b) } \frac{5^{-6} \cdot 4}{(-2)^2 \cdot 10^{-3}} = \frac{2^2 \cdot 10^3}{2^2 \cdot 5^6} = \frac{2^3 \cdot 5^3}{5^6} = \frac{2^3}{5^3} = \left(\frac{2}{5}\right)^3$$

 3) A boy gave his cousin  $\frac{1}{6}$  of his Halloween candy, he ate  $\frac{1}{4}$  of the candy, and saved 35 pieces of candy. How many pieces of candy did he start with?

$$\frac{1}{6} + \frac{1}{4} = \frac{2+3}{12} = \frac{5}{12}$$

35



$$35 \div 5 = 7 \rightarrow 7 \times 12 = 84$$

Solution: he started with 84 pieces of candy

4) Complete:

Decimal notation	Standard form	Standard form with 4 s.f.
2710558	$2.710558 \times 10^6$	$2.711 \times 10^6$
0.000352839	$3.52839 \times 10^{-4}$	$3.528 \times 10^{-4}$
342080000	$3.4208 \times 10^8$	$3.421 \times 10^8$
0.0000194307	$1.94307 \times 10^{-5}$	$1.943 \times 10^{-5}$

5) Complete:

$\sqrt{-\frac{1}{4}} = \text{Not real}$	$\sqrt{\frac{1}{4}} = \pm \frac{1}{2}$	$\sqrt[3]{-8} = -2$
$\sqrt[3]{(-2)^3} = -2$	$(-2)^{-2} = \frac{1}{4}$	$-2^4 = -16$

6) Work out (expressing each number as a fraction) and write the solution in decimal notation:  $1.30\overline{5} - 1.\overline{8}$

$$N = 1.30\overline{5} \rightarrow \left. \begin{array}{l} 100N = 130.555\overline{5} \\ 1000N = 1305.555\overline{5} \end{array} \right\} \rightarrow 900N = 1175 \Rightarrow N = \frac{1175}{900} = \frac{47}{36}$$

$$N = 1.\overline{8} \rightarrow \left. \begin{array}{l} 10N = 18.88\overline{8} \\ N = 1.888\overline{8} \end{array} \right\} \rightarrow 9N = 17 \Rightarrow N = \frac{17}{9}$$

$$1.30\overline{5} - 1.\overline{8} = \frac{47}{36} - \frac{17}{9} = \frac{47 - 68}{36} = -\frac{21}{36} = -\frac{7}{12}$$

7) A restaurant paid 112€ for a coffee machine after having been given a 20% discount. What was the original price of the coffee machine?

$$\frac{80}{100} = \frac{112}{x} \Rightarrow 80x = 112 \cdot 100 \Rightarrow x = \frac{11200}{80} = 140$$

Solution: The original price of the coffee machine was 140€

8) Factor the polynomials:

a)  $4x^3y + 4x^2y + xy = xy(4x^2 + 4x + 1) = xy(2x + 1)^2$

b)  $18m^2n^3 - 50n^3 = 2n^3(9m^2 - 25) = 2n^3(3m + 5)(3m - 5)$

9) Work out:

a)  $x(x - 3)^2 - 3x(x + 1)(x - 1) + 6x^2 = x(x^2 - 6x + 9) - 3x(x^2 - 1) + 6x^2 = x^3 - 6x^2 + 9x - 3x^3 + 3x + 6x^2 = -2x^3 + 12x$

b)  $(x^2 - 5x + 6)(x^2 - x) = x^4 - x^3 - 5x^3 + 5x^2 + 6x^2 - 6x = x^4 - 6x^3 + 11x^2 - 6x$

10) Work out and simplify:

a)  $\frac{x^2 - 1}{x^2 - 2x + 1} \cdot \frac{2x - 2}{(x + 1)^2} = \frac{(x + 1)(x - 1)2(x - 1)}{(x - 1)^2(x + 1)^2} = \frac{2}{x + 1}$

b)  $\frac{x^2 - 4}{8x^2 + 16x} \div \frac{x - 2}{4x^3} = \frac{(x^2 - 4) \cdot 4x^3}{(8x^2 + 16x)(x - 2)} = \frac{(x + 2)(x - 2) \cdot 4x^3}{8x(x + 2)(x - 2)} = \frac{x^2}{2}$