1st 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) $\frac{a^4\cdot b^2\cdot b^5}{b^4\left(a^{-2}\right)^{-2}}=$

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

3) A boy gave his cousin 1/6 of his Halloween candy, he ate 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		
	3.4208×10^{8}	
	1.94307×10^{-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: $1.30\widehat{5}-1.\widehat{8}$

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) $\left(x^2-5x+6\right)\cdot\left(x^2-x\right)=$

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:

a) $\frac{-3}{4}\cdot\left(1-\frac{2}{3}+\frac{3}{2}\right)-\left(\frac{1}{2}\right)^2=-\frac{3}{4}\cdot\left(\frac{6-4+9}{6}\right)-\frac{1}{4}=-\frac{3}{4}\cdot\frac{11}{6}-\frac{1}{4}=$

$=-\frac{11}{8}-\frac{1}{4}=-\frac{11}{8}-\frac{2}{8}=-\frac{13}{8}$

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

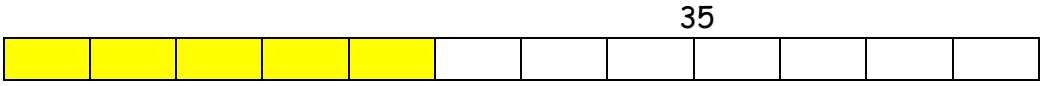
2) Write each of the following expressions as a single positive power:

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

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 1/6 of his Halloween candy, he ate 1/4 of the candy, and saved 35 pieces of candy. How many pieces of candy did he start with?

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



$35\div 7=5\rightarrow 5\times 12=60$ Solution: he started with 60 pieces of candy

4) Complete:

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

5) Complete:

$\sqrt{-\frac{1}{4}}=$ 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: $1.30\widehat{5} - 1.\widehat{8}$

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

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

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

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