

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)
$$-\frac{1}{5} \cdot \left(2 - \frac{2}{3} + \frac{3}{4}\right) - \left(\frac{1}{2}\right)^2 =$$

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

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

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

b)
$$\left(\frac{2}{5}\right)^{-2} \div \left(\frac{2}{5}\right)^{-4} =$$

3) Calculate and express your result using standard form:

a)
$$(3.15 \cdot 10^7) \div (3 \cdot 10^{-3}) =$$

b)
$$(1.5 \cdot 10^4 + 2.3 \cdot 10^5) \cdot 2 \cdot 10^{-2} =$$

4) Complete:

$\sqrt{-\frac{1}{9}} =$	$\sqrt{\frac{1}{9}}$ =	3√−27 =
$\sqrt[3]{(-7)^3} =$	$(-3)^{-2} =$	$-5^{2} =$

5) Classify the following numbers and express the rational numbers as fractions:

$$-1.5$$
, $0.010010001...$, $-\sqrt{5}$, $-0.2\hat{3}$, $0.181818...$, $\frac{6}{3}$

6) Donovan took a math test and got 35 correct and 10 incorrect answers. What was the percentage of incorrect answers? (Round to the nearest hundredth)

7) Work out and simplify:

a)
$$\frac{x^2-4}{x^2-4x+4} \cdot \frac{3x-6}{(x+2)^2} =$$

b)
$$\frac{x^2-9}{4x^2+12x} \div \frac{x-3}{2x^3} =$$

8) Solve the following equations:

a)
$$\frac{x-1}{6} - \frac{x-3}{2} = -1$$

b)
$$3(x-3)^2 - (x+2)(x-2) = 31$$

9) Solve:
$$\frac{2x}{3} - \frac{x+2}{5} = 1 - (x-3)^2$$

10) Translate each sentence into an equation:

a) Seven times the sum of two different numbers gives ten.

b) Twice a number plus three is equal to twenty.



SOLUTION

1) Work out and simplify:

a)
$$-\frac{1}{5} \cdot \left(2 - \frac{2}{3} + \frac{3}{4}\right) - \left(\frac{1}{2}\right)^2 = -\frac{1}{5} \cdot \left(\frac{24 - 8 + 9}{12}\right) - \frac{1}{4} = -\frac{1}{5} \cdot \frac{25}{12} - \frac{1}{4} = -\frac{5}{12} - \frac{1}{4} =$$

$$= -\frac{5}{12} - \frac{3}{12} = -\frac{8}{12} = -\frac{2}{3}$$

b)
$$\frac{5}{12} - 1 - \frac{1}{3} + \frac{5}{6} \div \frac{1}{2} = \frac{5}{12} - 1 - \frac{1}{3} + \frac{5}{3} = \frac{5}{12} - \frac{12}{12} + \frac{16}{12} = \frac{9}{12} = \frac{3}{4}$$

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

a)
$$\frac{(ab^3)^2 \cdot b^{-2} \cdot b^5 \cdot a^2}{b^4(a^{-2})^{-2}} = \frac{a^2b^6 \cdot b^3 \cdot a^2}{b^4 \cdot a^4} = \frac{b^9 \cdot a^4}{b^4 \cdot a^4} = b^5$$

b)
$$\left(\frac{2}{5}\right)^{-2} \div \left(\frac{2}{5}\right)^{-4} = \left(\frac{2}{5}\right)^{-2-(-4)} = \left(\frac{2}{5}\right)^2$$

3) Calculate and express your result using standard form:

a)
$$(3.15 \cdot 10^7) \div (3 \cdot 10^{-3}) = 1.05 \cdot 10^{7+3} = 1.05 \cdot 10^{10}$$

b)
$$(1.5 \cdot 10^4 + 2.3 \cdot 10^5) \cdot 2 \cdot 10^{-2} = (1.5 \cdot 10^4 + 23 \cdot 10^4) \cdot 2 \cdot 10^{-2} = 24.5 \cdot 10^4 \cdot 2 \cdot 10^{-2} = 24.5 \cdot 10^4 \cdot 2 \cdot 10^{-2} = 24.5 \cdot 10^4 \cdot 2 \cdot 10^{-2} = 4.9 \cdot 10^3$$

4) Complete:

-+) complete:			
$\sqrt{-\frac{1}{9}}$ = It doesn't exist	$\sqrt{\frac{1}{9}} = \pm \frac{1}{3}$	$\sqrt[3]{-27} = -3$	
$\sqrt[3]{(-7)^3} = -7$	$(-3)^{-2} = \frac{1}{(-3)^2} = \frac{1}{9}$	$-5^2 = -25$	

5) Classify the following numbers and express the rational numbers as fractions:

$$-1.5$$
, $0.010010001...$, $-\sqrt{5}$, $-0.2\hat{3}$, $0.181818...$, $\frac{6}{3}$

$$-1.5$$
 rational number, negative $\rightarrow -1.5 = -\frac{15}{10} = -\frac{3}{2}$

0.010010001.... irrational number, positive

- $-\sqrt{5}$ irrational number, negative
- -0.23 rational number, negative

$$N = 0.2\hat{3} \rightarrow \frac{100N = 23.333...}{10N = 2.333...} \rightarrow 90N = 21 \Rightarrow N = -\frac{21}{90} = -\frac{7}{30}$$

0.181818..... rational number, positive

$$N = 0.1818... \rightarrow \frac{100N = 18.1818..}{N = 0.1818...} \rightarrow 99N = 18 \Rightarrow N = \frac{18}{99} = \frac{2}{11}$$



 $\frac{6}{3}$ Natural number

6) Donovan took a math test and got 35 correct and 10 incorrect answers. What was the percentage of incorrect answers? (Round to the nearest hundredth)

35 correct and 10 incorrect, total 45

$$\frac{10}{x} = \frac{45}{100} \Rightarrow 1000 = 45x \Rightarrow x = \frac{1000}{45} = \frac{200}{9} = 22.2222.... \approx 22.22$$

Solution: The percentage of incorrect answer was 22.22%

7) Work out and simplify:

a)
$$\frac{x^2-4}{x^2-4x+4} \cdot \frac{3x-6}{(x+2)^2} = \frac{(x+2)(x-2)}{(x-2)^2} \cdot \frac{3(x-2)}{(x+2)^2} = \frac{3(x+2)(x-2)^2}{(x+2)^2(x-2)^2} = \frac{3}{x+2}$$

b)
$$\frac{x^2 - 9}{4x^2 + 12x} \div \frac{x - 3}{2x^3} = \frac{(x + 3)(x - 3)}{4x(x + 3)} \cdot \frac{2x^3}{(x - 3)} = \frac{2x^3(x + 3)(x - 3)}{2 \cdot 2x(x + 3)(x - 3)} = \frac{x^2}{2}$$

8) Solve the following equations:

a)
$$\frac{x-1}{6} - \frac{x-3}{2} = -1 \rightarrow \frac{x-1}{6} - \frac{3x-9}{6} = -\frac{6}{6} \Rightarrow x-1-3x+9 = -6$$

 $x-3x = -6-9+1 \Rightarrow -2x = -14 \Rightarrow x = 7$

b)
$$3(x-3)^2 - (x+2)(x-2) = 31 \Rightarrow 3(x^2 - 6x + 9) - (x^2 - 4) = 31$$

 $3x^2 - 18x + 27 - x^2 + 4 = 31 \Rightarrow 2x^2 - 18x = 0 \Rightarrow x(2x - 18) = 0 \Rightarrow \begin{cases} x = 0 \\ 2x - 18 = 0 \Rightarrow x = 9 \end{cases}$

9) Solve:
$$\frac{2x}{3} - \frac{x+2}{5} = 1 - (x-3)^2 \rightarrow \frac{10x}{15} - \frac{3x+6}{15} = \frac{5(1-x^2+6x-9)}{15}$$

$$10x - 3x - 6 = 15 - 15x^2 + 90x - 135 \rightarrow 15x^2 - 83x + 114 = 0$$

$$x = \frac{83 \pm \sqrt{83^2 - 4 \cdot 15 \cdot 114}}{2 \cdot 15} = \frac{83 \pm \sqrt{49}}{30} = \frac{83 \pm 7}{30} = \begin{cases} \frac{83 + 7}{30} = 3\\ \frac{83 - 7}{30} = \frac{76}{30} = \frac{38}{15} \end{cases}$$

- 10) Translate each sentence into an equation:
- a) Seven times the sum of two different numbers gives ten. 7(x+y)=10
- b) Twice a number plus three is equal to twenty. 2x + 3 = 20