Complete the following problems **without using a calculator** :

1. Evaluate:

   a) $\frac{1}{2} \div 3 = \frac{1}{2} \times \frac{1}{3} = \boxed{\frac{1}{6}}$

   b) $\frac{1}{2} \div \left(\frac{-1}{4}\right) = \frac{1}{2} \times \left(-\frac{4}{1}\right) = \boxed{-2}$

   c) $7(3^2 - 4) = 7(9-4) = 7(5) = \boxed{35}$

   d) $2^{-3} = \frac{1}{2^3} = \boxed{\frac{1}{8}}$

   e) $(3^2)^{-1} = 3^{-2} = \frac{1}{3^2} = \boxed{\frac{1}{9}}$

2. Evaluate and express your answer as a decimal:

   a) $5 + \frac{3}{2} = \frac{10}{2} + \frac{3}{2} = \frac{13}{2} = 6\frac{1}{2} = \boxed{6.5}$

   b) $\frac{3}{4} - 2 = \frac{3}{4} - \frac{8}{4} = -\frac{5}{4} = -1\frac{1}{4} = \boxed{-1.25}$

3. Simplify:

a) $8^{\frac{2}{3}}2^{\frac{-1}{3}}$ $=(2^3)^{2/3}2^{-1/3}=2^2\,2^{-1/3}=2^{2-1/3}=2^{6/3-1/3}=\boxed{2^{5/3}}$

b) $\sqrt{16x^6}$ $=\sqrt{4^2(x^3)^2}=\boxed{4x^3}$

c) $10^{\frac{1}{2}}10^{\frac{3}{2}}$ $=10^{1/2+3/2}=10^{4/2}=10^2=\boxed{100}$

4. Simplify:

a) $10x-(3x-(7x+2))$ $=10x-(3x-7x-2)=10x-(-4x-2)$
$=10x+4x+2=\boxed{14x+2}$

b) $\dfrac{(4/5x)}{(-2/15x)}$ $=\dfrac{4}{5x}\times\dfrac{-15x}{2}=(2)(-3)=\boxed{-6}$

5. Find the product:

a) $(4x+6)^2$ $=(4x+6)(4x+6)=16x^2+24x+24x+36$
$=\boxed{16x^2+48x+36}$

b) $(2x+1)(5x-8)$ $=10x^2+5x-16x-8=\boxed{10x^2-11x-8}$

c) $6x(3x^2-7x+2)$ $=\boxed{18x^3-42x^2+12x}$

6. (Please write the fractions in the simplest form.)

a) Convert 35% to a fraction. Convert 35% to a decimal.

$35\% = \frac{35}{100} = \frac{7}{20}$ $\qquad 35\% = 0.35$

b) Convert 0.12 to a percent. Convert 0.12 to a fraction.

$0.12 = 12\%$ $\qquad 0.12 = \frac{12}{100} = \frac{3}{25}$

c) Convert $\frac{3}{5}$ to a percent. Convert $\frac{3}{5}$ to a decimal.

$\frac{3}{5} = \frac{x}{100}$

$3(100) = 5x$

$\frac{300}{5} = x$

$x = 60$

since $\frac{3}{5} = \frac{60}{100}$ then

$\frac{3}{5} = 60\% = 0.6$

7. Solve for x.

a) $12x - 8 = -2$

$12x = -2 + 8$

$12x = 6$

$x = 6/12 = 1/2$

b) $\frac{2x+5}{10x+3} = \frac{1}{3}$

$(2x+5)3 = (10x+3)1$

$6x + 15 = 10x + 3$

$15 - 3 = 10x - 6x$

$12 = 4x$

$\frac{12}{4} = x$

$3 = x$

8. a) What is $\frac{1}{3}$ of $\frac{3}{5}$? $\left(\frac{1}{3}\right)\times\left(\frac{3}{5}\right)=\boxed{\frac{1}{5}}$

b) What is 20% of 84? $84 \times .20 = 16.80$ → 16.80

c) 75% of what number is 36? $75\% = \frac{3}{4}$

$\frac{3}{4}x = 36$

$x = \frac{1}{3}6\left(\frac{4}{3}\right)$

$\boxed{x = 48}$

9. Your average so far in a class is 88. This average counts for 75% of your grade and the final exam counts for 25% of your grade. What do you need to make on the final exam for your course average to be at least 90?

$88(0.75)+x(0.25)=90$

$66 + x(0.25) = 90$

$x(0.25) = 24$

$x(\frac{1}{4}) = 24$

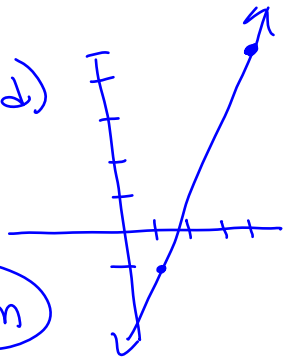
$x = (24)(4)$

$\boxed{x = 96}$

88 × 0.75 = 440 + 616 = 66.00

10. A line contains the points (4,5) and (1, -1).
a) Find the equation of the line.
b) What is the slope of the line?
c) What is the y – intercept of the line?
d) Graph the line.

d)



$\text{SLOPE} = \frac{\text{change in } y}{\text{change in } x} = \frac{5-(-1)}{4-1} = \frac{6}{3} = 2 = m$

$y = mx + b$ where m = slope and b = y intercept

to find the y intercept, substitute $m = 2$ and either given point and solve for b.

$y = mx + b$

$5 = 2(4) + b$

$5 = 8 + b$

$-3 = b$

sp:
a) $y = 2x - 3$
b) $m = 2$
c) $b = -3$

11. Consider the equation $y = 3x - 8$

a) Find y when $x = -1$. $y = 3(-1) - 8 = -3 - 8 = \boxed{-11}$

b) Find x when $y = 2$. $2 = 3x - 8$

$10 = 3x$

$\boxed{\frac{10}{3} = x}$

12. a) Write using scientific notation: 0.0000683 $= \boxed{6.83 \times 10^{-5}}$

b) Write in decimal form without scientific notation: 1.82×10^{-6}

$\boxed{0.00000182}$

13. Evaluate:

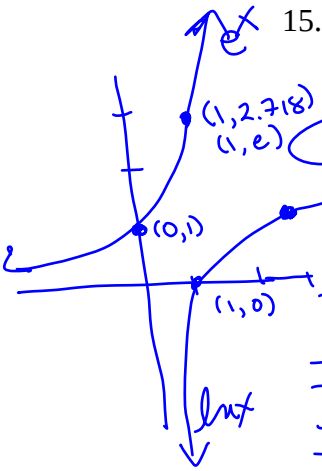
a) $\log_2 8 = x \Rightarrow 2^x = 8 \Rightarrow 2^x = 2^3 \Rightarrow \boxed{x = 3}$

b) $\ln \sqrt{e} = \ln(e^{1/2}) = \boxed{1/2}$

c) $e^{2 \ln 2} = e^{\ln 2^2} = 2^2 = \boxed{4}$

14. Simplify: $\ln 3x - \ln 9x = \ln(3x) + \ln(9x)^{-1}$

$= \ln\left(\frac{3x}{9x}\right) = \boxed{\ln\left(\frac{1}{3}\right)}$



15. Select the best answer:

I. $e \approx 2.718$ II. $e \approx 3.14$ III. $e = \ln(1)$

a) I only is true
b) II only is true
c) III only is true
d) I and III are true

I. $e \approx 2.718$ is true. e is a constant approx ≈ 2.718

II. $\pi \approx 3.14$ (not e) so this statement is false

III. $e \approx 2.718$, $\ln(1) = 0$ (since $e^0 = 1$) so this statement is false.

16. The price of gas increased by 8% in June and another 15% in July. What was the total percentage increase from June 1 to July 31?

$$\begin{array}{r} 1.08 \\ \times\ 1.15 \\ \hline 540 \\ 108 \\ 108 \\ \hline 1.2420 \end{array}$$

1.242 ⇒ 24.2% increase for the two months

$P(\text{nausea}) = 0.3 \quad P(\text{good}) = 0.7$

17. Approximately 30% of patients receiving a medication experience nausea.

a) Suppose 2 patients are selected at random. Find the probability that both patients experience nausea.

b) Suppose 2 patients are selected at random. Find the probability that neither experience nausea.

c) Suppose 2 patients are selected at random. Find the probability that exactly one experiences nausea.

d) Suppose 2 patients are selected at random. Find the probability that at least one experiences nausea.

EACH OF THE TWO PATIENTS COULD BE EITHER "NAUSEOUS" OR "GOOD". SO THE POSSIBLE EVENTS ARE: $\{(N,N), (N,G), (G,N), (G,G)\}$ ← calculate these individual probabilities first

$P(\text{BOTH ARE NAUSEOUS}) = P(N,N) =$
$= P(1^{st} \text{ NAUSEOUS AND } 2^{nd} \text{ NAUSEOUS})$
$= P(N)\,P(N) = (0.3)(0.3) = 0.09$

$P(1^{st} \text{ NAUSEOUS AND } 2^{nd} \text{ GOOD}) = P(N,G)$
$= P(N)\,P(G) = (0.3)(0.7) = 0.21$

$P(1^{st} \text{ GOOD AND } 2^{nd} \text{ NAUSEOUS}) = P(G,N) =$
$= P(G)\,P(N) = (0.7)(0.3) = 0.21$

$P(1^{st} \text{ GOOD AND } 2^{nd} \text{ GOOD}) = P(G,G)$
$= P(G)\,P(G) = (0.7)(0.7) = 0.49$

CHECK $0.09 + 0.21 + 0.21 + 0.49 = 1.00$ ✓

SO, a) $P(\text{BOTH ARE NAUSEOUS}) = \boxed{0.09}$

b) $P(\text{NEITHER NAUSEOUS}) = \boxed{0.49}$

c) $P(\text{EXACTLY ONE IS NAUSEOUS}) = P(N,G) \text{ OR } (G,N)$
$= P(N,G) + P(G,N) = 0.21 + 0.21 = \boxed{0.42}$

d) $P(\text{AT LEAST ONE IS NAUSEOUS}) =$
$= P[(N,G) \text{ OR } (G,N) \text{ OR } (N,N)]$
$= P(N,G) + P(G,N) + P(N,N)$
$= 0.21 + 0.21 + 0.09 = \boxed{0.51}$