Math 207: Statistics
Warmup Exercises

1. Without using a calculator, say whether each of the following is about 1%, 10%, 25% or 50% —

(a) 39 out of 398

(b) 99 out of 407

(c) 57 out of 209

(d) 99 out of 197

2. Among beginning statistics students in one university, 46 students out of 446 reported family incomes ranging from $40,000 to $50,000 a year. Answer the following without a calculator.

(a) About what percentage had family incomes in the range $40,000 to $50,000?

(b) Guess the percentate that had family incomes in the range $45,000 to $46,000 a year.

(c) Guess the percentage that had family incomes in the range $46,000 to $47,000 a year.

(d) Guess the percentage that had family incomes in the range $47,000 to $49,000 a year.

3. Draw a pair of axes and plot each of the following points:

$$(1,1) \qquad (2,2) \qquad (3,3) \qquad (4,4)$$

What can you say about the points?

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What can you say about the points?

Exercise: Simplify each of the following:

a) $\frac{1}{3} + \frac{1}{2}$

b) $\frac{1}{4} + \frac{1}{2} + \frac{1}{5}$

c) $\frac{1/2}{2}$

d) $\sqrt{\frac{4}{9}}$

e) $\frac{1/2 + 1/5}{3}$

f) $\sqrt{1 - \left(\sqrt{3}/2\right)^2}$

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f) $\sqrt{1 - \left(\sqrt{3}/2\right)^2}$

Solutions are in blue.

1. Without using a calculator, say whether each of the following is about 1%, 10%, 25% or 50% —

(a) 39 out of 398

(b) 99 out of 407

(c) 57 out of 209

(d) 99 out of 197

(a) $\frac{39}{398} \approx \frac{40}{400} = \frac{4}{40} = \frac{1}{10} = 10\%$.

(b) $\frac{99}{407} \approx \frac{100}{400} = \frac{1}{4} = 25\%$.

(c) $\frac{57}{209} \approx \frac{50}{200} = \frac{5}{20} = \frac{1}{4} = 25\%$.

(d) $\frac{99}{197} \approx \frac{100}{200} = \frac{1}{2} = 50\%$.

2. Among beginning statistics students in one university, 46 students out of 446 reported family incomes ranging from \$40,000 to \$50,000 a year. Answer the following without a calculator.

(a) About what percentage had family incomes in the range \$40,000 to \$50,000?
$\frac{46}{446} \approx \frac{46}{460} = \frac{1}{10} = 10\%$.

(b) Guess the percentate that had family incomes in the range \$45,000 to \$46,000 a year.
The total range from (a) was \$45,000 – \$50,000. So, the range for (b) is 1/10 of that range. If we take 1/10 of the 10% total, then we get 1%. If we think about the boxes of a histogram. the \$45K – \$50K box has width 10 and area 10%. So it has height 1 ($w \times h = a$). The slice between \$45K and \$46K has width 1 and height 1.

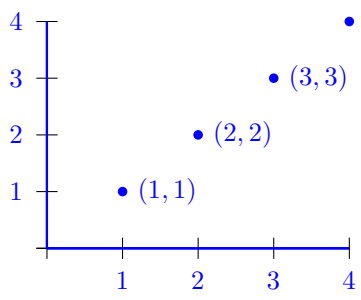
(c) Guess the percentage that had family incomes in the range \$46,000 to \$47,000 a year.
The range \$46,000 – \$47,000 is 1/10 of the total again. So, its area is also 1%.

(d) Guess the percentage that had family incomes in the range \$47,000 to \$49,000 a year.
This interval has width 2 so the area is 2%.

3. Draw a pair of axes and plot each of the following points:

$(1, 1)$ $(2, 2)$ $(3, 3)$ $(4, 4)$

What can you say about the points?



The points are all on a line.

Exercise: Simplify each of the following:

a) $\frac{1}{3}+\frac{1}{2}$

a) $\frac{1}{3}+\frac{1}{2}=\frac{2}{6}+\frac{3}{6}=\frac{5}{6}$

b) $\frac{1}{4}+\frac{1}{2}+\frac{1}{5}$

b) $\frac{1}{4}+\frac{1}{2}+\frac{1}{5}=\frac{5}{20}+\frac{10}{20}+\frac{4}{20}=\frac{19}{20}$

c) $\frac{1/2}{2}$

c) $\frac{1/2}{2}=\frac{1/2}{2}\times\frac{2}{2}=\frac{(1/2)\times 2}{2\times 2}=\frac{1}{4}$

d) $\sqrt{\frac{4}{9}}$

d) $\sqrt{\frac{4}{9}}=\frac{\sqrt{4}}{\sqrt{9}}=\frac{2}{3}$

e) $\dfrac{1/2+1/5}{3}$

e) $\dfrac{1/2+1/5}{3}=\dfrac{\frac{5}{10}+\frac{2}{10}}{3}=\dfrac{7/10}{3}=\dfrac{7/10}{3}\times\dfrac{10}{10}=\dfrac{7}{30}$

f) $\sqrt{1-\left(\sqrt{3}/2\right)^2}$

f) $\sqrt{1-\left(\sqrt{3}/2\right)^2}=\sqrt{1-\left(\dfrac{\sqrt{3}}{2}\right)^2}=\sqrt{1-\left(\dfrac{3}{4}\right)}=\sqrt{\dfrac{1}{4}}=\dfrac{1}{2}$. Notice that to do $\left(\frac{\sqrt{3}}{2}\right)^2$, we have to square the top and the bottom. So, $(\sqrt{3})^2=3$ and $(2)^2=4$.