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excellent work!

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Assignment 7 - Probabilities — March 30/09

1. a) Picture Slots: 4 random images displayed, each drawing from a selection of 10 images.

Image slots → 1 2 3 4 → $10^4 = 10{,}000$ ← total number of image outcomes
# of images available → 10 10 10 10

✓

b) Probability of winning something:

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It is easier to find out the probability of each image being distinct from one another, ($P(\text{not } E)$) then minusing it from one → $1 - P(\text{all distinct}) = P(E)$

Image slots → 1 2 3 4 → $\frac{10 \times 9 \times 8 \times 7}{10{,}000} = \frac{5040}{10{,}000}$ ∴ 0.504
available images if all are distinct. → 10 9 8 7

↳ total outcomes available (10·10·10·10)

$1 - 0.504 = 0.496$ ∴ the probability of winning something with this machine is 49.6%

✓

c) Probability of having exactly 3 of a kind: any 3 images, in any variation

Image slots → 1 2 3 4

available images for exactly 3 of a kind →

10 ×	1 ×	1 ×	9
X	X	X	
10 ×	1 ×	9 ×	1
X	X		X
10 ×	9 ×	1 ×	1
X		X	X
9 ×	10 ×	1 ×	1
	X	X	X

Four possibilities for exactly 3 of a kind.

→ Each slot has 10 images to draw from, therefore one slot has 10, two others only have 1 (to match 1st image) and the fourth slot has 9.

∴ $\frac{\text{possibilities}}{4 \cdot 10 \cdot 1 \cdot 1 \cdot 9} = \frac{360}{10{,}000}$ ∴ 0.036 → the probability of getting exactly 3 of a kind is 3.6%

↳ total outcomes

✓

d) Probability of having 4 matching images:

Image slots → 1 2 3 4
available images for all the same → 10 × 1 × 1 × 1 → There is only one way to get 4 of a kind. Each slot has 10 images, ∴ one slot has 10 to draw from and the remaining three have only 1 (to match the 1st).

✓

∴ $\frac{10 \times 1 \times 1 \times 1}{10{,}000} = \frac{10}{10{,}000}$ ∴ $\frac{1}{1{,}000}$ or 0.001 → the probability of getting 4 matching images is 0.1%.

Very nice work!

2 Rolling a pair of fair dice: (* there are 36 total outcomes btwn 2 dice *)

a) P(rolling sum of 7 or 11) = 2/9 or ~22%

Sum of 7 → 1,6 / 2,5 / 3,4 / 4,3 / 5,2 / 6,1 } 6 possibilities

Sum of 11 → 5,6 / 6,5 } 2 possibilities

∴ 6/36 + 2/36 = 8/36 ∴ 4/18 ∴ 2/9

✓

b) P(rolling a double) = 1/6 or ~16.6%

Possible doubles → 1,1 / 2,2 / 3,3 / 4,4 / 5,5 / 6,6 } 6 possibilities

∴ 6/36 = 1/6

✓

c) P(sum is >4) = 5/6 or ~83.3%

Sums ≤4 → 1,1 / 1,2 / 2,1 / 2,2 / 3,1 / 1,3 } 6 possibilities

P(E) = 1 − P(not E)

∴ 1 − 6/36 = 30/36 ∴ 5/6

✓

8/8

3. Tossing a coin twice:

a) 1st toss = Heads P(2 Heads tossed) = 1/2 or 0.5%

2nd toss = ?

1st 2nd

Possible outcomes → H,H } 50% chance of either

H,T }

b) one toss is heads, unknown if 1st toss or 2nd toss.

P(2 heads tossed) = 1/3 or $0.3\overline{3}$ %

Possible outcomes → H,H

H,T } 1/3

T,H

4/4 ✓

4. Honda sells 10,000 cars; Sample 800 cars at random, 250 are Honda.

a) Assuming that the sample size is representational of all all areas in the Honda selling ratius, the estimate for the number of cars in my area is 32,000.

$\frac{250}{10,000} = 40$ ← proportional scale $40 \cdot 800 = 32,000$ ✓

b) If the Rolls-Royce dealership had of been contacted, instead of the Honda dealership, the estimate for number of cars in my area would have been less accurate. This is because Rolls-Royces are much more expensive than Hondas, Thus one can assume less would be sold in comparison. Thus the sample size would be not be representational or proportional (may not even see one Rolls-Royce in an afternoon of observation).

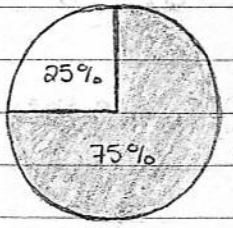
5/5 Correct and seeing one Rolls-Royce more or less would have a significant impact on your outcome.

5 Class Survey:

$\frac{6}{8} = 0.75$ $\frac{2}{8} = 0.25$

Female
male

Gender



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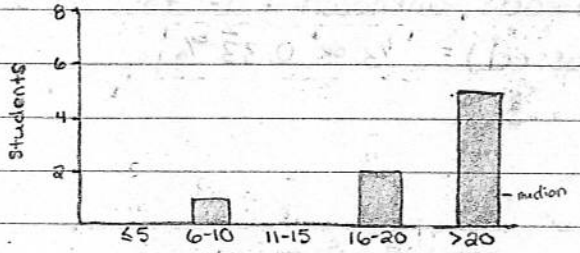
Courses taken thus far

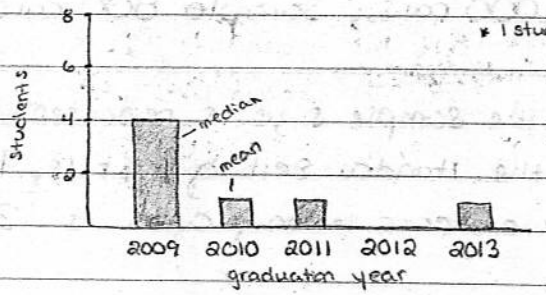


lies within 16-20

median = >20 (4) students.

Side note:
It is interesting that in choosing my four questions I ended up with one pie chart and 3 histographs, each of which demonstrates the different ways that the median and mean may be used (ie/ only median applicable, both mean + median applicable, neither applicable)

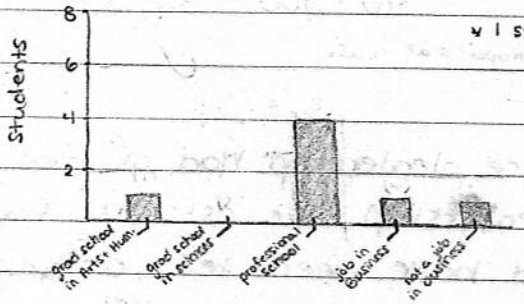
Expecting to graduate



mean = 2010 $\left(\frac{2009+2009+2009+2010+2011+2013}{7}\right)$

median = 2009 (3.5) students

Post grad plans



It is interesting that in a first year math course the majority of the students are female, in their last two years of school - which correlates positively with the data showing that the majority of the students have taken over twenty courses thus far - and that 50% of them plan to attend professional school post graduation (whereas 0% will pursue graduate studies in sciences).

✓