Use the information provided to solve the problem listed below. Be sure to show your work at all phases of problem solving. Refer to the **Mathematics Problem Solving Official Scoring Guide** to receive the highest score in each of the five process dimensions.

#M6

Math teachers always claim that doing homework helps students get better grades in their math classes. To test this theory a survey of high school math students was conducted and the following results were obtained:

- 48% complete math homework regularly
- 55% have a B average or better in math class
- 40% do not complete math homework regularly AND have less than a B average in math class.
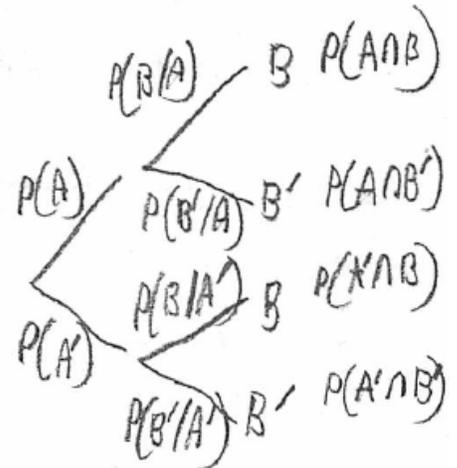
Using this data, does it appear that students who complete math homework regularly are more likely to have an average of B or better in math class? Justify your answer using mathematics.

Solution ①

I decided to make a probability tree
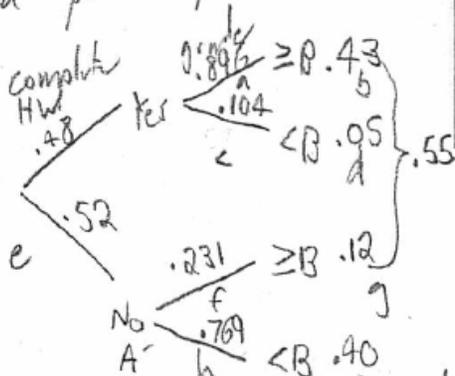
$$P(B/A) = \frac{.43}{.43 + .05} = .896$$

label all missing branches (parts)

a-h

$e = 1 - .48 = .52$

$h = .40 \div .52 = .769$

$f = 1 - .769 = .231$

$g = .52(.231) = .12$

$b = .55 - .12 = .43$

$a = .43 \div .48 = .896$

$c = 1 - .896 = .104$

$d = 1 - (.43 + .12 + .40) = .05$

The evidence is overwhelming, of those who complete HW regularly, 89.6% get a B or better compared to 10.4% who do worse.

Of those who DONT complete HW Regularly, 76.9% get below a B compared to a mere 23.1% who do better.

The answer is YES. It appears that students who do math HW regularly are more likely to earn a B or better.

Reflection

Here is a Venn diagram - which is an easier way.
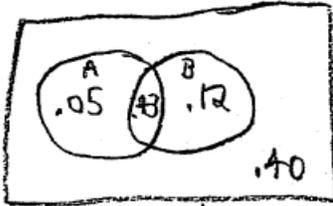
A = Students who do homework regularly
B = Students who get a B or better

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$
$$.6 = .48 + .55 - P(A \cap B)$$

or

~~$P(A \cap B) = .48 + .55 - .6$~~
$$P(A \cap B) = .43$$
$$.48 - .43 = .05$$
$$.55 - .43 = .12$$

43% Do homework AND have a B or better
40% Don't do homework AND have less than a B
only 12% have a B or better AND don't do homework
5% do homework AND have less than a B

My conclusion stands! Do your homework
if you want a good grade in Math!

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#M8

Math teachers always claim that doing homework helps students get better grades in their math classes. To test this theory a survey of high school math students was conducted and the following results were obtained:

- 48% complete math homework regularly
- 55% have a B average or better in math class
- 40% do not complete math homework regularly AND have less than a B average in math class.

Using this data, does it appear that students who complete math homework regularly are more likely to have an average of B or better in math class? Justify your answer using mathematics.

→ 5% do not complete hw and have b average or above

$\frac{u}{30} = .12$

Yes, it proves that the students who do homework average better scores there is u small gap but is too small to make a difference

$\frac{17}{30} = .55$

17 students have b average or above.

This means some students (approx. 3) do not regularly do homework and still recieve b avg. or above.

Sample Classroom size: 30 students

$\frac{14}{30} = .48$

– 14 students do homework.

$\frac{12}{30} = .40$

– 12 students don't do homework

– u students inaccounted for.

M

Use the information provided to solve the problem listed below. Be sure to show your work at all phases of problem solving. Refer to the **Mathematics Problem Solving Official Scoring Guide** to receive the highest score in each of the five process dimensions.

#M10

Math teachers always claim that doing homework helps students get better grades in their math classes. To test this theory a survey of high school math students was conducted and the following results were obtained:

- 48% complete math homework regularly
- 55% have a B average or better in math class
- 40% do not complete math homework regularly AND have less than a B average in math class.

Using this data, does it appear that students who complete math homework regularly are more likely to have an average of B or better in math class? Justify your answer using mathematics.

$\cdot 40\%$ of class $< B$ no h-work

$\cdot 55\%$ of class $> B$

$\cdot 48\%$ complete h-work

	Do	Don't	
B↓	$5/100$	$40/100$	$45/100$
B↑	$43/100$	$12/100$	$55/100$
	$48/100$	$52/100$	

$100 - 55 = 45$

$100 - 48 = 52$

$52 - 40 = 12$

$55 - 12 = 43$

For Example
100 students

Yes it does! First only 12% of students who don't do h-work have a B average or better. Then if you look at the 48% of students who do h-work 43% of them B's or better compared to the 5% that do h-work with less than B's. If you look at it a second way you get the same answer. Take a look at the students with B's 43% do their h-work and only 12% can get a B without h-work.

48 do their h-work and 43 would have B's
55 have B's the majority 43 do h-work.

Use the information provided to solve the problem listed below. Be sure to show your work at all phases of problem solving. Refer to the **Mathematics Problem Solving Official Scoring Guide** to receive the highest score in each of the five process dimensions.

#M22

Math teachers always claim that doing homework helps students get better grades in their math classes. To test this theory a survey of high school math students was conducted and the following results were obtained:

- 48% complete math homework regularly
- 55% have a B average or better in math class
- 40% do not complete math homework regularly AND have less than a B average in math class.

Using this data, does it appear that students who complete math homework regularly are more likely to have an average of B or better in math class? Justify your answer using mathematics.

48% - complete
40% - don't complete
12% - sometimes

40% - B↓
55% - B↑
5% - other

100% - 55% = 45%

45% do not have B's, 40% of them don't do homework, 5% do.
55% have B's, 48% of students do homework.

ratios:

$\frac{45}{40} = 1.125$

$\frac{55}{48} = 1.146$

← more students do homework and pass with B's or higher.

Use the information provided to solve the problem listed below. Be sure to show your work at all phases of problem solving. Refer to the **Mathematics Problem Solving Official Scoring Guide** to receive the highest score in each of the five process dimensions.

#M29

Math teachers always claim that doing homework helps students get better grades in their math classes. To test this theory a survey of high school math students was conducted and the following results were obtained:

- 48% complete math homework regularly
- 55% have a B average or better in math class
- 40% do not complete math homework regularly AND have less than a B average in math class.

Using this data, does it appear that students who complete math homework regularly are more likely to have an average of B or better in math class? Justify your answer using mathematics.

do not hw + <B = 40%
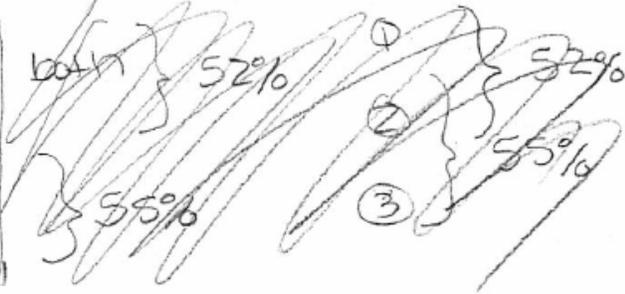do not hw + ≥B = 12%
do hw + <B = 5%
do hw + ≥ B = 43%
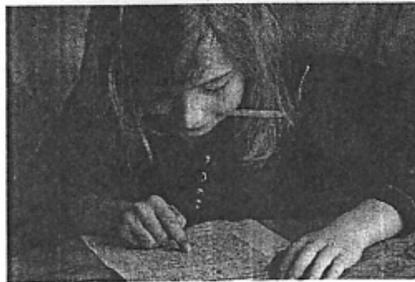
It is right, but there are some kids, who don't do homework and hw have good grades, and some kids, who do homework and don't have good grades

do complete m.homework r.: 48%
do not complete m.homework r: 100-48= 52%

≥ B
< B

:55%
:45% grade

do not complet. m.hwr : 40% + <B
~~do complete m.hwr + ≥R : 8%~~
do not complet m.hwr + ≥R : X

③ do complete m.hwr + ≥B : 4
④ do complete m.hwr + <B : 2

① Not <B   1+2 → 52%
② Not ≥B   1+3 → 45%
③ do <B   2+4 → 55%
④ do ≥B   3+4 → 48%

1 = 40%   2 = 12%
1 = 40%   3 = 5%
2 = 12%   4 = 48%
3 = 5%   4 = 43%

both 52%   ① 52%
55%   ② 55%
            ③

Scores and Commentary: Homework & Grades, Paper #M-6

Making Sense of the Task (MS)	Representing and Solving the Task (RS)	Communicating Reasoning (CR)	Accuracy (AC)	Reflecting and Evaluating (RE)
5	6	6	5	6

MS 5: The student looks at the task through two distinct approaches. Both are thoroughly developed by the use of models and probability notation.

RS 6: The strategies used are complex. The student employs Bayes' Theorem as a strategy and then uses the joint and marginal probabilities to answer the question a second time.

CR 6: The use of mathematical language and formal probability notation are both insightful and enhanced. The use of models makes it easy for the reader to move from one thought to another.

AC 5: Correct answers are reached by using conditional probabilities and joint probabilities. The student connects the two solutions by recognizing that joint probabilities support the claim and the conditional probability provides strong "overwhelming" evidence for the claim.

RE 6: The student reworks the task using a different method and evaluates the relative efficiency of different approaches taken, "Here is a Venn diagram, which is an easier way."

Scores and Commentary: Homework & Grades, Paper #M-8

Making Sense of the Task (MS)	Representing and Solving the Task (RS)	Communicating Reasoning (CR)	Accuracy (AC)	Reflecting and Evaluating (RE)
3	2	3	2	1

MS 3: The interpretation of the task is only partially developed. The student displays the correct joint probabilities, but does not support the joint probabilities with correct mathematics.

RS 2: The student attempts to estimate the distribution of students by using a theoretical class of 30 students creating rounding issues that are in conflict with the solution. The student is missing the critical probability of homework and a B average in math. This Work Sample represents a strong 2.

CR 3: The communication contains significant gaps and is hard to follow. The student never addresses the implications of rounding given the estimate of only 30 students. The final claim asserts proof, but it is disjointed and not supported by mathematics.

AC 2: The solution is incomplete and not justified with mathematics.

RE 1: The reflection is not evident.

Scores and Commentary: Homework & Grades, Paper #M-10

Making Sense of the Task (MS)	Representing and Solving the Task (RS)	Communicating Reasoning (CR)	Accuracy (AC)	Reflecting and Evaluating (RE)
4	4	4	4	4

MS 4: The interpretation is both effective and complete. The student shows an understanding of the key concepts and how the given information is related by translating percentages into a sample size of 100.

RS 4: The strategy is effective and complete. The table provides a simple way to compute the missing probabilities and the commentary interprets the results correctly.

CR 4: All of the important elements are in place and the path through the work is clear. The student supports the conclusion by comparing the joint probabilities two different ways.

AC 4: The solutions given are correct and supported by the work.

RE 4: All of the values in the table are justified by the equations below. The conclusion is drawn by looking at the data two different ways. This Work Sample represents a strong 4.

Scores and Commentary: Homework & Grades, Paper #M-22

Making Sense of the Task (MS)	Representing and Solving the Task (RS)	Communicating Reasoning (CR)	Accuracy (AC)	Reflecting and Evaluating (RE)
2	2	3	2	1

MS 2: The interpretation is partially developed. The use of ratios is applied inappropriately.

RS 2: The strategy selected is sketchy and underdeveloped. The student correctly computes one missing marginal probability and two missing joint probabilities, but does not compute the required probabilities to support the claim.

CR 3: The communication contains significant gaps. The description of the probabilities lacks precision and contains errors.

AC 2: The solution given is incomplete and incorrect.

RE 1: The ratios as a reflection of the concepts and strategies are ineffective, and it is not particularly evident that the use of ratios represents the student reflecting on their claim.

Scores and Commentary: Homework & Grades, Paper #M-29

Making Sense of the Task (MS)	Representing and Solving the Task (RS)	Communicating Reasoning (CR)	Accuracy (AC)	Reflecting and Evaluating (RE)
4	4	3	3	2

MS 4: The student correctly interprets the task and computes and displays all of the joint and marginal probabilities.

RS 4: The strategy selected is effective, complete and could lead to a correct solution.

CR 3: The communication of the reasoning has significant gaps and is only partially displayed forcing the reader to assemble the solution path.

AC 3: The solution is partially correct and not justified with mathematics.

RE 2: The initial work is repeated, but it is not clear if this is done as a review making the reflection very sketchy.