Elizabeth Jachens: So, sort of like a, from a projection, from here on out even though it does say this course ends at 8:30 I’m shooting for around eight. I will stick around for as much feedback or additional questions that you want to ask me. So that's just a timeline if any of you are kind of working around someone else’s schedule or having someone pick you up from here, 8 o'clock is my time I'm shooting for. And then before, I think I've hit some of the people who left at the hour, but make sure you pick up a practice test at the end, it's a really great way to time yourself, sort of, remember two minutes per question, two minutes per question. Alright so we just have two sections left to kind of go over some practice problems.
And the first one is geometry. Geometry might be one of the things you've put in the back covered and not used since high school. You deal with some lines you knowing parallel versus perpendicular, you have angles so you need to know the different angle theorems and what makes up complementary angles, you have polygons, sort of identifying what polygons, which polygons are named what, and there's also an important formula called the inside angle formula, you have triangles using the Pythagorean theorem as well as like comparing or like scaling two triangles, you have quadrilaterals, knowing the area of parallelograms, trapezoids, and circles you have chords and arcs, and I left a comma because there's more, I was going to put section though, and then you do have some 3-D figures and this is volume and surface area. But you only need to know the volume and surface area of a circle, anything more elaborate than that they're going to give you that equation for. So again this is sort of, if one of these you think you're a little less great on, sort of mark it so you know to come back.
So good geometry formulas to know. So the first one is the inside angles for a polygon, I had this exact question on my test and this is not an equation I knew, so it was just a strange one right. If you have like any cited angle or any cited figure, anywhere from three sided up to hundred cited you can find out what sum of the interior angles are, like for example if you had a triangle right, we know intuitively that if you add up all three of these angles it has to equal 180, but that's not always something that you know for a six sided figure, and so the formula just says "N-2", so N meaning the number of sides -2×180, so for a triangle it would be 3-2 is 1 times 180, so the sum of the angles have to be 180°. And so on my test it asked me what's the sum of the interior angles for six sided figure, except for it didn't say six sided figure it said, whatever a hexagon, yeah, like I said this is not my strong point. So it said hexagon, not only did I not know what a hexagon meant, I didn’t know this in my opinion, obscure formula, so who knows maybe one of you will get it. Pythagorean Theorem that just says the hypotenuse squared is equal to the sum of the side squared, that's for a triangle. And the other thing to be familiar with right, if you have a bisecting lines how those angles, that relationship between them.
So we have three problems for this one. The first one is all about angles and so it says find the angle in measure of degrees for the GEF and the DEG. So you guys can try this yourselves but just naming triangles or angles right. GEF whatever letter or numbers in the middle, that's going to be like your vortex point so that way you can identify different angles. So these two angles are just, they're just a description of the line with a bisect in it so this is another sort of property right, these two have to add up to 180°. Any two angles that are on opposite sides of a bisecting line have to equal 180°. I only gave you guys a minute on that one sorry. So you take 180° is equal to just the sum of the angles, right. So you can algebraically solve for this by moving all the constants to the left hand side.
Answer- Lines

From the general rules about relationships between angles formed by intersecting lines, you know that the sum of angles along a straight line is 180°. Angles DFG and GEF lie along a straight line; they are supplementary angles. Therefore, \((x + 20) + (x - 60) = 180\). Simplify:

\[
\begin{align*}
2x - 40 &= 180 \\
2x &= 220 \\
x &= 110
\end{align*}
\]

Since \(x\) is 110, the angle measures are \((x + 20) = (110 + 20) = 130\) and \((x - 60) = (110 - 60) = 50\), and the answer is (C).

[Silence]
So adding them together you get to 220 is 2X, and you’re just solving for X. So this is sort of where you want to make sure you solve the problem completely because you might be tempted just to find an answer with 110 in it and run from there. But you just have to remember that this is just the value of X this is not the value of your angle. So this first angle is right, it's a 130, just 20 over that, and this one is your 110 minus 60, so those are your two angles. Are there any questions on that one? That was maybe more familiar.
Answer- Lines

From the general rules about relationships between angles formed by intersecting lines, you know that the sum of angles along a straight line is 180°. Angles DFG and GEF lie along a straight line; they are supplementary angles. Therefore, \((x + 20) + (x - 60) = 180\). Simplify:

\[
2x - 40 = 180 \\
2x = 220 \\
x = 110
\]

Since \(x = 110\), the angle measures are \((x + 20) = (130 + 20) = 130\) and \((x - 60) = (110 - 60) = 50\), and the answer is (C).

[Silence]
This next one, so this is the first one I showed you guys but this is the numerical entry question, this is what it's going to look like. You're going to have a question but instead of having a multiple-choice answer, you're going to have right, a box you click in to type. You guys can go ahead and give this a try. So kind of just start you guys off, so it says the area of the circle who' centers O has an area of 16 pie, so the area of a circle is pie R squared and we just said that, that is equal to 16 pie, so we can solve for the radius.
So we have a radius of 4. And your radius is expressed right from the center of your circle to any exterior point, so this side right has a length of four as well as well as this side has a length of 4.
And so it says what is the area of the triangle? So now you have to use the formula for an area of a triangle.
So I would go ahead and do this, we have a base and a height, both equal to 4 to solve for your area. So in this problem it doesn't express anything about how many decimal places it wants, if it wants it in real you know, it doesn't tell you anything about how you want the answer and this is something that is a little subtle but if it doesn't express right, what sort of like decimals, or how rounding is going to happen it always wants an integer.
So this is something that...

**Audience Member:** What's next to the eight?

**Elizabeth Jachens:** Okay it is, so what sort of units do we have for area? So squared right, and this is just my units squared. Yeah it's just expressed as an area.

**Audience Member:** Okay great.
Elizabeth Jachens: Yeah, so that was the other thing is your units never go inside of your box. All units are going to be on the outside of your box and they're going to give them to you. So all you would do is you would put your cursor over the box, you click it and type an eight.

Audience Member: So just to clarify, if there is a box you don't put any decimals, it's always looking for a whole number?

Elizabeth Jachens: Yeah if something, if it doesn't state otherwise, it doesn't say round to two decimals, if it doesn't say anything about rounding in this problem statement right here it wants a whole number.

Audience Member: Is the answer most likely going to be a whole number?

Elizabeth Jachens: Yes. So if you got 8.44 and it didn't tell you anything about rounding, I would probably look it over again. If there's any decimals in there and it's not going to turn out to be a whole numbers they will express. Yes, round to the nearest tenth, round to the nearest hundredth, yep. And they actually usually don't even say that, they say round to one decimal. So that way you don't have to do that conversion, say a tenth is one decimal, a hundredth is two decimals.

Audience Member: [Inaudible]

Elizabeth Jachens: They can't, they for which ever reason they say that one is too far, so.
Answer- Circles

Start with what you know—the area of a circle is given by the equation $A = \pi r^2$. Solve for the length of the radius:

$$A = \pi r^2$$
$$16\pi = \pi r^2$$
$$16 = r^2$$
$$r = 4$$

In the figure, the radius of the circle is also the base and height of the isosceles right triangle. The area of a triangle is given by the equation $A = \frac{1}{2} \text{(base)} \times \text{(height)} = \frac{1}{2} \times 4 \times 4 = 8$.

The area of the triangle is 8 square units.

[Silence]
So we have one more sample question for angles for geometry. You guys can go ahead and start on this one, and then in about a minute I will catch up.

**Audience Member:** Does that say 20 or...

**Elizabeth Jachens:** Which one? Right here.

**Audience Member:** In the corner. That says 20 in the top.

**Elizabeth Jachens:** Yeah I actually wrote that one in because in my practice book they don't have them written in, but on the test, yeah on the test, I scribbled it in, but on the test they will actually put in any information they give they also show you if it's like a length that they can, they will also put it on the figures. I bought the 2011 practice book because it was cheaper than the 2013 one but that's just a small change that they've done.
Okay, so this is the answer and I'm going to show this kind of as I'm doing it so you can see it two places. And this is one of the problems I think should be an advanced problem but is considered intermediate, the key piece of information that some people didn't pick up or would've not of picked up.
Is that it tells you that AB is your diameter which means it crosses in the center. So that is a piece of information that is kind of given as your head information that it's pretty important to solving this.
So the second, so after you know that this is the diameter right, if you take any two points, if you take the diameter at a third point anywhere you're always going to get a right angle for this third piece. Whichever point on your circle that is not part of your diameter has to come together at a 90° angle.

**Audience Member:** Can you say that again?

**Elizabeth Jachens:** Yeah so from the previous problem we knew that this line AB is given as the diameter and this is just one of those strange properties that I don't know who figured it. But any time that you have, that you make a triangle using the diameter this third point, if I made this point D right, anytime you do that they're always going to come together at a right angle. And the reason I picked this problem is because I have this exact problem on my test with different angles, but yeah I looked at this and I thought what in the world could this be. So that is just property of a circle.
Audience Member: So is the question basically just asking if what is the angle of BAC?

Elizabeth Jachens: Yeah so BAC, BAC is right here, from B to A to C is that angle right here and because we know that this is a right angle for that triangle, I'm going to erase point D. Because we know that's a right angle, we know they have to add up to 180° right. So we have 180° is equal too, we know that one is 20, we know this one has to be 90, because we just said that it's a right angle. And then angle A right, that last angle, I guess I'll write it as BAC.
So we have to solve for BAC, so we find out that the measure of that angle is actually 70° and so we found out the quantity A...
Is the same right as quantity B,
Because quantity A was the measure of $\angle BAC$ and quantity B was $70^\circ$, so our answer is C. Geometry has all sorts of hidden shortcuts. Are there any more questions on this one or can?
Or do you want to go to the data analysis section? Okay.
So it's data interpretations, sorry. So data interpretation, how many of you have taken like 105 or 107? So okay, so quite a few of you, that's a really good place to start. There's quite a bit of like sort of statistics like questions on this section, there is a little bit of probability, a little bit about like, like how something is distributed, so there's a little bit of your statistics that you can pull on which is really nice. But the additional portion they add to this is, is they add graphs, so they add bar charts, pie graphs, stratified graphs, line charts, all sorts of things just to basically try to decide if you can change something that's graphical and put into a numerical format. So there, it's like counting methods which you can all count on your fingers if you haven't taken statistics. There's some distribution of data, just a couple keywords. And then some distribution for some random variables but the bottom two theoretically are being phased out for the 2016 exam. So I have an example, there is an example on this test but you may or may not see it depending on when you take the test.
So there are lots of different types of graphs and tables. But there's right, you have frequency distribution which is shown on the top right, it can either be given counts or percentages. They have segmented bar graphs which is the one on the bottom left, right, those are just stacked so you have to make sure you read those numbers correctly. Pie charts and on the bottom right are your frequency distribution graphs, there all, you can all explain data in the same piece of data in all of these different methods so it just is a preference.
So let's go on to the first sample question, and this one is about charts. I don't know how well you guys can read it. So actually skip the first one, go the second one, see where it says "sample question charts", and there's, yeah this one. So it will give you, and most the time for each chart and graph there will be two or three questions, so it is not like it's eating up all of your time. It's not like you have to look at a chart, figure out what it means, and only answer one question. So there's usually going to be two or three questions on it, so that's just a heads up. So for this one it says "Which countries exported less than the average number of MMT exported by all the countries named in these charts?", so the first thing you have to do is you have to find the average, which is maybe less than helpful because you're given it in charts. And chart types, this is one the sections where they will give you redundant information or information that you will not use. The other sections are pretty good about it they give you a number it's going to be used somewhere in your calculations, and in this section it's not the case. So for in this one, for this question you only need one of these two graphs to answer this single question, and for this one it's the bar graph on the bottom. So it's a little intimidating, I would usually tell you to read the question first before you start looking at the graphs or tables because it is really likely that you won’t actually need to look at both of them. So just pick, just spend your time looking at the one that you actually need for that question.
So for this one the first thing you need to do is you need to find the average rice that is produced, so you just find the arithmetic mean right, sum up the terms and divide them by how many terms you did. So you get an answer just over three for that one. And then so this indicate all that apply, and this is another change in the test that they're debating. So this one is from my book so it's an older and it does say indicate all that apply. In the 2016 test they may take out that wording and just have you do the boxes, but as of the test right now it does have those instructions on it. And so now it's just your job to check which ones do you have more rice exported than the mean which is three, and so out of these answers you have Thailand which is at 5.8 and you have Vietnam so you would check both A and B.

Audience Member: It says less than the average number, so.

Elizabeth Jachens: Less? Oh fine you do the opposite then, opposite of what I just said. Yeah so you would have then Pakistan, India, and the United States.

Audience Member: There thinking about taking out "indicate all that apply"?

Elizabeth Jachens: Correct and just having, and just only having those square boxes.

Audience Member: So we just need to know about those boxes.

Elizabeth Jachens: nd yeah, honestly once you get through two or three problems it will be a little more second nature, it will be like "oh square boxes, check, check". So that's all speculation as of now, whether or not they're actually going to go through with it.
About four years ago they did major rehaul on the test, no five years ago, so the version before my book. So they change things from year to year quite a bit though, I mean nothing serious but just small changes. So that would be a typical intermediate problem for data interpretation.
So we have I think just two more examples and then we're out of here, so we will be just right on time. So this is a probability question, I'm going to erase the board and want you guys to try it. Maybe some of you who have had statistics before, this might be a place for you to shine, maybe explain it as we are going. Okay so for any of you who haven't had statistics you don't need statistics for this one, you can of course use statistics, it might be a little faster if you're comfortable with it. A problem like this I would probably do graphically. So it says a principal has four trophies that he has available for display but he only has two display cases, so that's what I know so far. You can only fit one trophy in each case and it says how many different ways are there to display two trophies at any one given time. And so it's sort of implied here right, if a trophy is in this case it can't be in this case at the same time right. So okay that is sort of the implied part that the statistics would tell you that you just have to make sure about. So basically what I would do for this one is I would say, right, how many choices if I move from left to right and I said okay this my first display case, how many trophies do I have to choose from?

Audience Member: Four.

Elizabeth Jachens: Four good. So I have four different choices, now I am going to pick one of them and I'm going to put it in this case and I'm going to close it. Now I go to my second case, how many different options do I have now for the second case?

Elizabeth Jachens: Three.

Yeah.
So all you have to do is you have to multiply these two options together, right. You can also for some of the other problems say you get 12, so you have 12 different options to display these trophies. And so this is a very, a very common kind of probability question that they're going to have. Are there any questions on this one? And the other one that they really love is like "If you have 20 marbles what's the probability of getting a green marble", you know questions like that.
Oh man, okay so that was like my last example I forgot. Well so these are some resources that you can look at. The ETS website is where you register for the test and you find, right where your testing center is, luckily we have one a campus, that website also does have some sort of review material, they do have a PDF that has all sorts of like math concept reviews but they don't have like a sample test available, they do have some sample questions. There are online resources, Stanford is one of them that you can actually pay to take practice exams that you can do online. I think it's pretty comparable to like just doing it like with the book that I have, I sticky noted mine, highlighted mine, my preference was doing it in hardback but they're about the same price if you want to do hardback versus like online exams. And then I think probably the most important prep is like kind of practice, just go through problems and time yourself. I have a practice exam from my Kaplan math workbook from the 2011 version that I am going to send you guys home with, the answers are on the very back and I printed it that way so you would be tempted not to look. So I would encourage you guys to kind of use this is as like the kick start to your studying, take this kind of go through it. Even if you do more than two minutes per question just kind of get the feel for it. All different types of questions are going to be in here and it’s going to be pretty easy for you to write down which ones kind of fit where. So.
Yeah.

**Audience Member:** So again it's just going to be plain math questions?

**Elizabeth Jachens:** There are two sections right, each section will have 20 math questions.

**Audience Member:** Each of the two sections are 35 minutes?

**Elizabeth Jachens:** Yeah it's just under two minutes per question.

**Audience Member:** Can you go over the ovals and fill in again?

**Elizabeth Jachens:** Yeah. So there are three types of like right sort of ways you can signify your answer right. The first one is if you of an oval bubble, the second type is if you have like squares, and then the third one is if you have like a box that you type into. If you have ovals like this, when you check an oval right it's going to fill completely in, and these are one answer only. The boxes are check all that apply right and when you click on these they look sort of 3-D but they actually X instead of fill all the way in, so don't be concerned about that. The ovals will actually fill like the mark black but the boxes will only have X's to signify that the answer is chosen. And then the last one that you have is you have a rectangular box that's a type box. Yeah and before the math section there's a directions page that is untimed that has these directions on it right now, that is untimed. So, yeah.
Audience Member: So when you finish one section you can go on to the next, then you can sit there for 5 minutes before you start, or do they turn off the screen?

Elizabeth Jachens: Yeah that’s a good question. Kind of as you go in and the first portion you have is you have your writing. I like to get it over with, I'm not a strong writer so for me it was I got it over with and I was happy. And that is an hour long. You have an optional five-minute break, you can sit at your screen, you can close your eyes, and just sit there and it will, after that five minutes it will automatically start your test. So if you decide to leave in that five minutes and if you come back seven minutes your test would already be started for two minutes. So that's just a thing to know, if you have the pee, pee way well before, but you don’t have to take those breaks if you don't want to. I usually said, and it will ask, it says would you like to take a five minute break, you push yes, or you push no. I usually pushed yes, I sat there, cooled off for a minute, got writing out of my head, started thinking about math formulas, whatever, and then pushed start or if you don't push start when the five minutes is up it will automatically bring you to that next page. Yeah?

Audience Member: So what is like the general breakdown of the full GRE test? Does it start with like three sections or just two sections?

Elizabeth Jachens: So you have, so the first section you have right is you have one hour for writing. So that is the very first thing that you do when you walk in the room and that's always going to happen. And then the next part which is not set is you have a total of, you have two of verbal and you have two sections of math. These can be in any order though, you don’t, it's not like math verbal math verbal it might be verbal verbal math.
math, so those are mixed up.

**Audience Member:** And you can't choose?

**Elizabeth Jachens:** No.

**Audience Member:** No, okay.

**Elizabeth Jachens:** Those, the sections are given to you in a certain order. So you, I'm not going to say can't can't, I'm pretty sure you can't, I've never tried.

**Audience Member:** Is verbal like for our reading comprehension and stuff like that? Vocab?

**Elizabeth Jachens:** Verbal is broken up into a couple major portions. One of them is reading comprehension, one of them is like vocabularies it's like find the best synonym for this fill in the blank, right, find the best word for this fill in the blank. I got the 500 most commonly used words for the GRE flash cards, so they have a little box, and I went through all of them. Yeah.

**Audience Member:** So they either or not show us the formulas ahead of time?

**Elizabeth Jachens:** Correct no formulas ahead of time. Any formula that you're given is going to be given on that screen page, and that's only for very obscure formulas. Yeah. Anymore questions? Yeah okay. So I hopefully will have enough practice tests for all of you, I'm
very happy with the turnout. Definitely you can, if you have questions you can stay after or there will be online like feedback and this is the first time we've done this one so I would encourage you guys give me suggestions for next year. Oh okay a formula worksheet I have one for you, I didn't print it.
If you go to this website there is under the math review PDF, there is a double sided the first page of it is a double-sided formula sheet of like the top equations to know. And I pulled off probably like 10 of them as I was showing you guys like the quadratic formula, like interest. So that is under this long website. But I would definitely add that if you think I should print off, like hand it out.