400m (Understanding and development)

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Thank you to those who I've learned from

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400m credentials:

- Wadeline Jonathas 49.60 (2019 NCAA champion and 4th place at worlds)
- Aliyah Abrams 51.13 (2019 NCAA fifth place, 12th place at worlds)
- Stephanie Davis (2020 SEC indoors runner up 52.15)
- Women 4x400 indoor national champions 2019
- Women 4x400 outdoor national 3rd place 3:26.90
- Pervious results in the 400m and 400 hurdles at Colorado State (Trevor Brown 49.64 400 hurdles)
- Egyptian Men national record Anasa Beshr 45.40

Some thoughts about the coaching the 400m

- The 400m (The fastest way to get spiritual, Clyde Hart's 4 Ps)
- To coach the event, you would have to understand it!
- The 400m seems easy to coach but it's demands are complicated and wide-ranged so keep an open mind and stay away from rigid ideology, think about coaching the type of athlete you have vs forcing a type of training that would hurt them or not improve them.
- When do you lose them?! You will lose your 400m athletes when you work them so hard and get them "fit" but with no PRs and improvements in their 400m performance. WE ARE ALL ABOUT FIT AND TOUGH IN A WAY THAT PRODUCES RESULTS!!!
- There are many ways to get to Rome, but it always comes down to speed!

Check out some facts about 200m ability for 400m sprinters

1. Michael Johnson 43.18 (Former world record holder in the 400m, happened to be former world record holder in the 200m)
2. Wayde Van Niekerk (current world record holder in the 400, happened to be one of two 400m sprinters that ran a sub 10 sec 100m, sub 20 sec 200) The other one is 4th all-time Michael Norman.
3. Sonya Richards-Ross number 9 all time, US record 400m record holder 48.70 holds a 200m PB of 22.09 (-0.3 wind) and 100m PB of 10.97 (-0.7 wind)!!!
4. Allyson Felix (200M 2012 OG champion, 2015 world champion in the 400m)
5. Top 9 women ever in the 400m ran sub 23 sec 200m

Some serious time was spent on this next fact!!

- 200m ability is essential for 400m success. Research shows that in the open 400m the first 200m speed has a higher correlation with overall 400m race time than the second 200m. The faster the PB in the open 200m, the faster they can come by at the first 200 of the 400m, the faster the overall race time will be!!

Simplifying the training approach

(What is the 400m race other than the first 200m and the 2nd 200m, break it down this way and understand it this way)

A- Improve speed and speed endurance to improve 200m PB, to be able to improve first 200m split.

B- Do specific special endurance workouts that targets strength in the second 200m of the 400m race, with paces that simulate the race to help your athletes survive the critical zone of the 400m (Critical Zone training to improve the second 200m)

- Performance outcome:

A- They will get faster in the first 200m

B- Because of the critical zone training they will be able to close well in the 2nd 200 and will be able to handle coming by faster in the first 200m without crashing in the second 200m.

Race distribution and realistic expectation to be fair with your athletes and to be able to hold them accountable

A- Depends on many factors: (Gender, Indoor or outdoor, time of the year, type of 400m sprinter, training age)

B- Generic guideline: 1st 200m = 200 PB+ 0.9-1.5 sec, 2nd 200m = 1st 200m time + 1.5 sec – 3.7 sec.

C- First 200m mathematical effect to understand its importance for a woman with 25.00 200m PB:

- Example A: comes by at 26.00 at the first 200m (+1.0 from PB) then runs 29.00 in the second 200m (+3 sec from the first 200m) final race time is 55.00 sec

- Example B: comes by at 26.50 at the first 200m (+1.5 from PB) then runs 29.00 in the second 200m (+2.5 sec from the first 200m) final race time is 55.50 sec

Conclusion: example A athlete beat example B athlete by .5 sec in the 400m race, although she had a stronger second half!

- BUT I DON'T RUN THE 400M THIS WAY??!!!

- Well, you didn't know how to run a fast 400m before, the good news is it hurts just the same!

How to get an electronic split for accurate assessment:

1. Use coach's eye or any other APP
2. Stand by the 200m mark
3. Film the light/smoke that comes out of the gun
4. Time it on the APP until athlete gets over the 200m mark
5. Check the over all electronic race time and start the analyses
6. Compare first 200m to 200m PR/season best
7. Compare the difference between the first 200m and second 200m
8. Come up with areas to fix and improve in the race plan and training

Types of 400m sprinters

A- Racers (200-400 type) has natural speed and can handle speed work and faster speed endurance work, longer endurance pace is closer to race pace. (Good)

B- Pacers (400-800 type) doesn't have much natural speed and/or can't handle speed work and faster speed work, longer endurance than Racers with paces that are far from race pace. (Okay)

C- Mixed (200-400 type) that can handle speed work, fast speed and special endurance, also can handle capacity work/aerobic and big volume work (IDEAL)

- All types need to come closer to one sec slower than 200m PB in the first 200m (Deal with it if you want to be good)

Race plan based on 400m sprinter type:

A- Racers plan: Push HARD and drive hard the first 60m, to get the momentum that will help you have a fast second 100m without straining, gather at 150, explode at 120, start gathering and explode earlier as you get fitter and more mature in the event.

B- Pacers plan: Push hard for 60m, gather at the 200m and explode at the 150.

C- Home stretch: Fight, stay relaxed, hold the form while staying alert, hold turn over “add a step or 2 in the last 50m”. Research shows loss of turnover rather than stride length in the 400m home stretch, so fight to keep your turnover “put your feet down coming home”!

Technical cues:

- A- The start and acceleration: shoulders up, knees up, push down and back, don't wait for the ground, finish the push
- B- Curve mechanics: Simulate the best curve runners in track and field (High jumpers), running on one line, feet landing in front of each other, shoulders turned toward the direction of travel "left!!", feet placement is similar to a monorail train NOT a Chu Chu train getting ready to derail!
- C- Maintenance phase: The fastest possible speed without being tense, if you are any faster you would be too tens to have a good race, if you are too slow you won't have a good race, learn to feel the sweet spot, (Relax and try harder) drop shoulders, relax jaw, sleepy eyes but anxious, wide awake and planning to win the race or make them go through everything they got to beat you, make it hard on them!
- D- If you can't reach out with your hand and touch them at the 300m mark "You might as well quit".

Program design concepts:

1- Understand the concept of transfer of training (put the hurt on them on the track but in a way to help them PB, how bad would it be if you train them hard with no improvements) The goal is to get them to PR not to ONLY put them in pain, use the correct/transferable pain to the race performance

2- Pacers: start with VO2 max and extensive tempo and as the training progresses start dropping volume, adding intensity and increasing recovery as you transition to lactate tolerance, special endurance work.

3- Racers: Start with intensive tempos (The slowest pace possible that still make them look like sprinters in terms of posture and mechanics, if it's too slow and too long where they look like middle distance runners then we aren't on the right track).

Address before the season:

A- Teach mechanics first, teach the start on the straight, then move to the curve, Develop speed, address starting blocks enough before the season starts

B- How to run the first 200m, using 400m race pace tables and coach's beeper or coach's pacer, teach relaxation and ASK the question! (IS THIS RACE FINISHABLE?!,teach them to feel the pace and conserve energy)

C- Teach curve sprinting mechanics

D- Teach how to run the indoor 400m

5- Twice a week endurance every week is too much, once a week is too few, solution: One week twice, the following week is 1 ½ times.(½ endurance day: Pacers= Vo2 max work – Racers short speed endurance that isn't too taxing)

6- How to get the 2nd 200m where it needs to be using "Critical Zone training)

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Stronger 2nd 200m work:

- Goal late season workout: 3 x 200m x 1 min rest with spikes on at the target/ideal second 200m pace, if they can hit these times in the last rep, they will do it in the race, LET THEM KNOW THEY ARE READY!!!

- Below is how to get there:

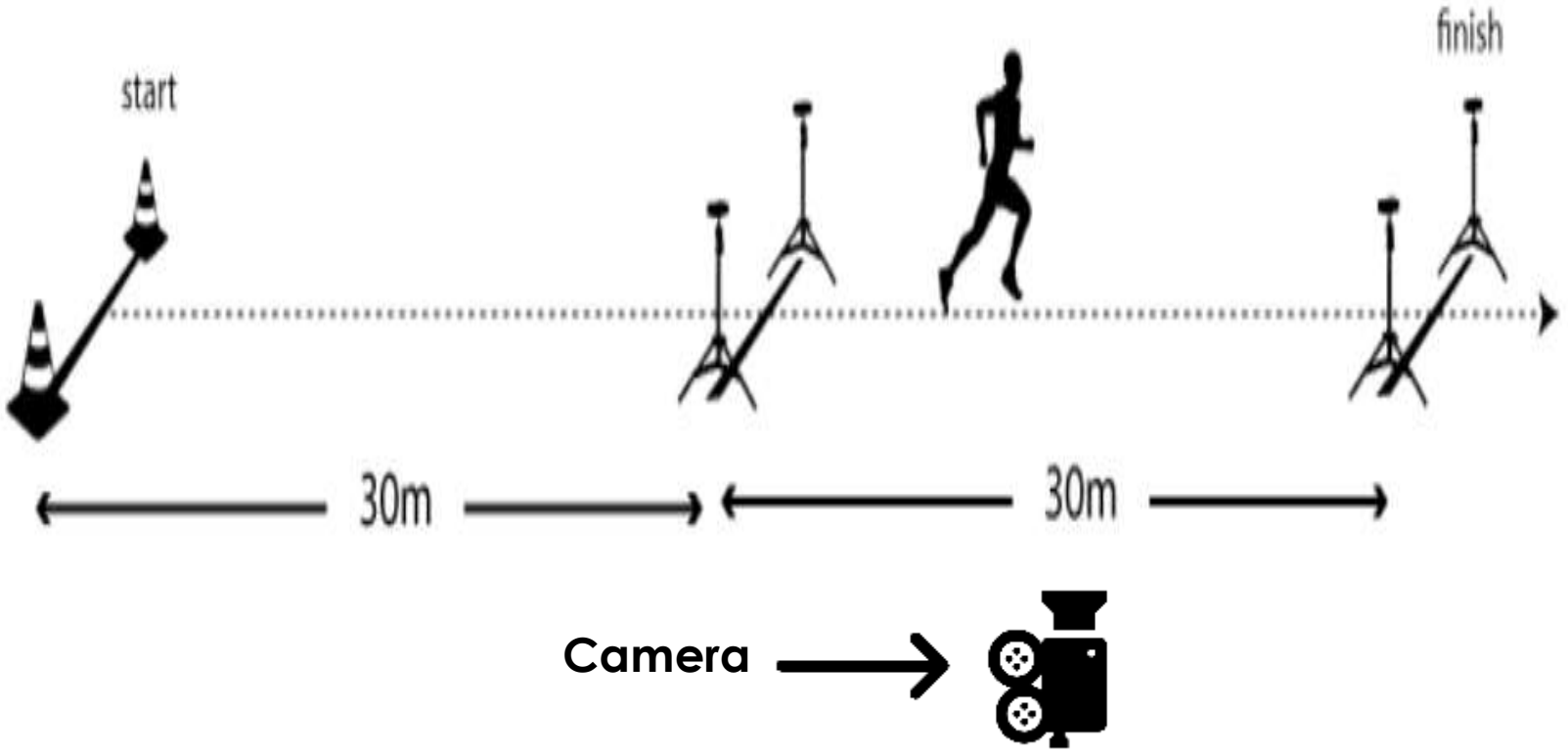
Workout	Total volume	Type of 400m sprinter	What would racer do in this sage
2 sets x 3 x 300m x 1 min/ 8-10 min	1800m	Pacers	4 x 300m x 5 min at a challenging pace
4 x 350m event run (Last 150 is a sec faster the first 200m) x 12’ rest	1400m	Pacer	-350,300,150 with descending recovery @ a fast consistent pace. 10m,8min - 400,300,200 x 12-15min, 8 min - 450,300,140 x 15min, 10min

4 x 350m event run (Last 150 is a sec faster the first 200m) x 12' rest	**1400m**	**Pacer**	**-350,300,150 with descending recovery @ a fast consistent pace. 10m,8min** **- 400,300,200 x 12-15min, 8 min** **- 450,300,140 x 15min, 10min**
3 x 400m x 12-15min (first toom at tempos pace, last 200m at target 2nd 200m pace)	**1200m**		**Both (Unit the team, and create 4x400 spirit)**
5 x 200m x 2 min at near target pace	**1000m**		**Both (Unit the team, and create 4x400 spirit)**
3 x 200m x 1 min rest at target pace	**600m**		**Both(Unit the team, and create 4x400 spirit)**

Understanding sprinting velocity

- Velocity = stride rate x stride length
- Velocity is measured by meters per seconds
- How to assess max velocity: 30 fly test (30m run in + 30m timed)
- What is a 3.10 sec in 30 fly? 30/3.10 = 9.67 meter per sec
- What does 3.10 sec in the 30-fly for a female sprinter mean? 60m: 7.20 – 100m: 11.17 - 200m: 22.73 - 400m: 49.46 to 50.46 in a balanced training program and depending on athlete type
- What is 9.67 meter per sec made of ? E.g. 4.6 steps per sec x 2.10m stride length or 4.5 steps per sec x 2.15m stride length

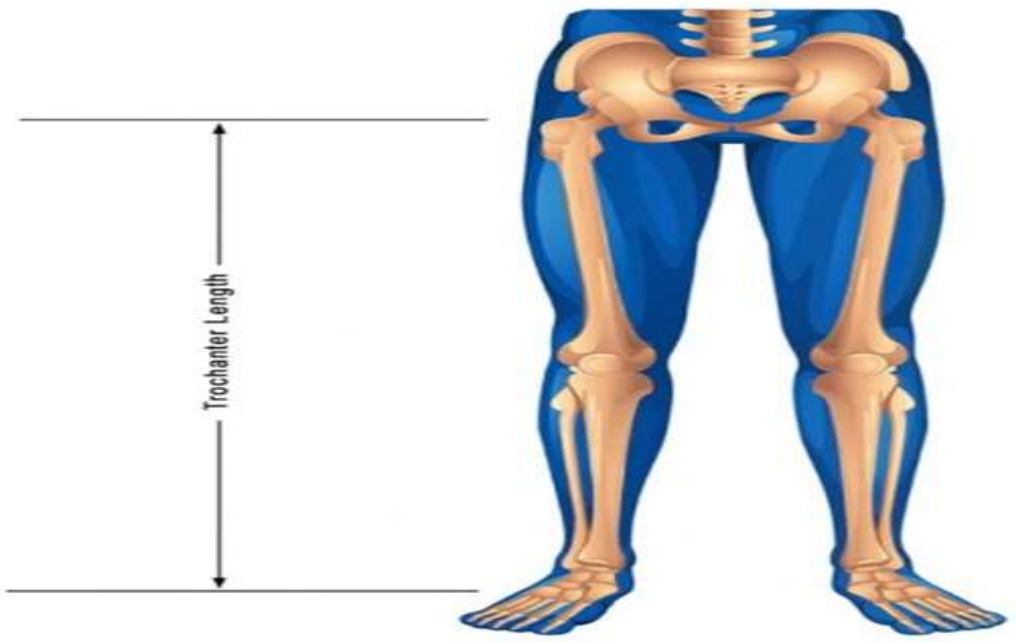
30m fly test setup to assess max velocity using electronic timing system



Place your Dartfish or Coach's Eye camera right at the 15m mark in the fly zone to be able to accurately assess stride frequency

Understanding your athlete by creating her/his velocity profile

1- Measure your athlete leg length (average of both legs) : e.g. .92cm for a woman sprinter



Understanding your athlete by creating her/his velocity profile

2- Perform a 30-fly test to measure their velocity (Hypothetical results 3.10 sec, which means a velocity of 9.67m per sec)

3- Use electronic timing system
4- Film from the 15m mark of the 30-fly zone with a coaching app (Coach's eye or dartfish)

5- Time each step using the coaching app will allow you to know your athlete stride rate E.g. time 5 consecutive steps and if the time is 1.06 you divide 5 by 1.06 and the answer will be 4.71 steps per sec

6- Do the math to identify your athlete stride length (stride length = velocity divided by stride rate) stride length = 9.67/4.71= 2.05m

Understanding your athlete by creating her/his velocity profile

Your athlete velocity profile:

1- Leg length: 92 cm
2- Velocity: 9.67 meter/ Seconds
3- Stride rate: 4.71 steps/ sec
4- Stride length: 2.05m
5- Relationship between leg length and stride length: 2.22

Generic Relationship between leg length – gender and stride length

- Women leg length in relation to maximum sprinting stride length in the max velocity phase: LL X 2.3-2.5 (on average LL x 2.4 is the generic average for women SL)

- Men leg length in relation to maximum sprinting stride length stride length in the max velocity phase: LL X 2.4-2.6 (on average LL x 2.5 is the generic average for women SL)

- My female athlete stride length is 2.22 of her leg length shows stride length deficiency

What to work on? And where to start when it comes to velocity development

- Frequency/ stride rate: If you don't have it, you're out of the sprinting game (4.5 - 5.0 steps per-sec. on average 5.3 was recorded in women 100m!!!)

- Stride length can't be great without it!!

- Goal of the training process get is to reach the highest level of velocity my get developing frequency and stride length.

- Frequency can be developed by two 10^{th} in one season e.g. improver from 4.6 to 4.8 steps per-sec while maintaining same stride length (Using the max velocity drill)

- Stride length can be improved by (improving mechanics, timing, strength in relation to body weight, power training such as resisted sprints and plyometrics, elastic bands etc.)

The plan

- To perfect max velocity mechanics you would need time, so it's appropriate to address the skill early in the preparation (Using max velocity drill progressions)
- To do that you would need to manipulate intensity to avoid injuries while using a forced mechanics drill to help ingrain the correct mechanics, timing)
- Start working on frequency over a shorter stride length to ensure lower power out put early in the training plan, and over time elongate the stride length to curry over higher levels of frequency to a longer stride length as your athletes get fitter and stronger (Velocity development)
- Use max velocity drill progressions based on athletes' gender and leg length to create individualized progressions, don't pass more then 90-95% of maximum stride length in practice since athletes are adrenaline free to avoided over striding

Max velocity drill progression 1 explained women

	A	B	C	D	E	F	G
1	MAX VELOCITY CHART				Progression 1		
2	For Women				Total distance in meters	Step #	Stride length in meters
3					0.99	T1-S1	0.99
4			Average maximum stride length for women/ Leg length in meter x 2.40		2.07	T2-S2	1.09
5	Leg Length in meters:	0.93	2.232	9 steps apparaoch	3.26	T3-S3	1.19
6					4.54	T4-S4	1.29
7					5.93	T5-S5	1.39
8	Week 1-6				7.41	T6-S6	1.49
9					9.00	T7-S7	1.59
10					10.68	T8-S8	1.69
11					12.47	T9-S9	1.79
12				Stride length is 80% of Maximum stride length	13.36	H1-S10	1.79
13				First level of effort over the first 4 hurdles	15.15	H2-S11	1.79
14					16.93	H3-S12	1.79
15					18.72	H4-S13	1.79
16				Stride length is 82.5% of Maximum stride length	20.56	H5-S14	1.79
17				Second level of effort over the second 4 hurdles	22.40	H6-S15	1.79
18					24.24	H7-S16	1.84
19					26.09	H8-S17	1.84
20				Stride length is 85% of Maximum stride length	27.98	H9-S18	1.84
21				Third level of effort over the third 10 hurdles	29.88	H10-S19	1.84
22					31.78	H11-S20	1.84
23					33.67	H12-S21	1.84
24					35.57	H13-S22	1.90
25					37.47	H14-S23	1.90
26					39.37	H15-S24	1.90
27					41.26	H16-S25	1.90
28					43.16	H17-S26	1.90
29					45.06	H18-S27	1.90
30							

Max velocity drill guiding criteria and training vision

- Intensity overload will cause adaptation (overload to get enough stimulus to trigger adaptation mechanize)
- Use frequency as a measure of intensity (Film the last 10 hurdles to assess intensity) and hold them accountable for their effort and intensity output to be able to cause change!
- Use velocity as a guideline for progress
- We are working and progressing to get the optimum not ideal/model stride length and stride rate (what combination of stride length and stride rate will create the highest possible velocity for that individual athlete??? That's the goal)

Monitoring progress until spotting the optimum model

- Start the max velocity drill progressions using the generic factor x leg Length/gender e.g. LL X 2.4 for women and LL x 2.5 for men
- Keep monitoring velocity over the last 10 hurdles as you progress through the 1st, 2nd and 3rd progression (Progress to
- If mechanics are appropriate in the last progression of the max velocity drill (the third progression) and velocity is at it's highest, then work on improving stride length by multiplying LL into a bigger factor e.g. male athlete LL X 2.525 and if velocity improves then progress to LL X 2.55 and if velocity improves then progress to 2.575 and if velocity improve then progress to LL X 2.60
- On July 11th, 2019 Wadeline Jonathas progressed in her third progression of the max velocity drill to LL X 2.50 which allowed her to create the highest velocity of the season 9.75m/sec out of (2.13 stride length x 4.58 step/sec)

Cont./Race related application

- Which means 3.07 in the 30 fly which indicates 22.53 200m ability, meaning she can come by in the 1st 200m of a 400m race comfortably at 23.7-23.9
- Coupled with an endurance development that allowed her to run 25.5 sec in the 2nd half of the 400m
- Which allowed us to predict sub 50 sec in the 400m (Lifetime best 49.60)

Sprints prediction table

Training (MT)															
30m fly	3.00	3.01	3.02	3.03	3.04	3.05	3.06	3.07	3.08	3.09	3.10	3.11	3.12	3.13	3.14
60m fly	6.01	6.03	6.05	6.07	6.09	6.11	6.13	6.15	6.17	6.19	6.21	6.23	6.25	6.27	6.29
90m fly	9.02	9.05	9.08	9.11	9.14	9.17	9.20	9.23	9.26	9.29	9.32	9.35	9.38	9.41	9.44
30m blocks	3.88	3.89	3.90	3.91	3.92	3.93	3.94	3.95	3.96	3.97	3.98	3.99	4.00	4.01	4.02
60m blocks	6.88	6.90	6.92	6.94	6.96	6.98	7.00	7.02	7.04	7.06	7.08	7.10	7.12	7.14	7.16
80m blocks	8.88	8.91	8.93	8.96	8.99	9.01	9.04	9.07	9.09	9.12	9.15	9.17	9.20	9.23	9.25
90m blocks	9.88	9.91	9.94	9.97	10.00	10.03	10.06	10.09	10.12	10.15	10.18	10.21	10.24	10.27	10.30
120m blocks	12.88	12.92	12.96	13.00	13.04	13.08	13.12	13.16	13.20	13.24	13.28	13.32	13.36	13.40	13.44
150m blocks	16.00	16.05	16.10	16.15	16.20	16.25	16.30	16.35	16.40	16.45	16.50	16.55	16.60	16.65	16.70
180m blocks	19.12	19.18	19.24	19.30	19.36	19.42	19.48	19.54	19.60	19.66	19.72	19.78	19.84	19.90	19.96
250m blocks	27.93	28.01	28.10	28.18	28.27	28.35	28.44	28.52	28.61	28.69	28.78	28.86	28.95	29.03	29.12
Competition (FAT)	(24 is added in)														
30m fly	2.88	2.89	2.90	2.91	2.92	2.93	2.94	2.95	2.96	2.97	2.98	2.99	3.00	3.01	3.02
30m blocks	4.12	4.13	4.14	4.15	4.16	4.17	4.18	4.19	4.20	4.21	4.22	4.23	4.24	4.25	4.26
60m blocks	7.00	7.02	7.04	7.06	7.08	7.10	7.12	7.14	7.16	7.18	7.20	7.22	7.24	7.26	7.28
90m blocks	9.88	9.91	9.94	9.97	10.00	10.03	10.06	10.09	10.12	10.15	10.18	10.21	10.24	10.27	10.30
100m	10.84	10.87	10.91	10.94	10.97	11.01	11.04	11.07	11.11	11.14	11.17	11.21	11.24	11.27	11.31
200m	22.05	22.12	22.19	22.26	22.33	22.39	22.46	22.53	22.60	22.67	22.73	22.80	22.87	22.94	23.00
100(1)	11.23	11.27	11.30	11.34	11.37	11.41	11.44	11.47	11.51	11.54	11.58	11.61	11.65	11.68	11.72
100(2)	10.82	10.86	10.89	10.92	10.95	10.99	11.02	11.05	11.09	11.12	11.15	11.19	11.22	11.25	11.29

Questions

Thank you for attending, Karim!