

Developed by the BC Provincial Nursing Skin and Wound Care Committee in collaboration with the Wound Clinicians from:



<b><u>TITLE</u></b>	<b>Procedure: Ankle Brachial Index(ABI) in Adults Using a Handheld Doppler</b>
<b><u>Practice level</u></b>	<ul style="list-style-type: none"> <li>Registered nurses must successfully complete additional education and related clinical practice before carrying out Ankle Brachial Index testing.</li> <li>Agency / health authority policy and standards should be in place to support this practice.</li> <li>The care of clients with peripheral arterial disease requires an interprofessional approach to provide comprehensive, evidence-based assessment and treatment. This clinical practice guideline focuses solely on the role of the nurse, as one member of the interprofessional team providing care to these clients.</li> </ul>
<b><u>Background</u></b>	<ul style="list-style-type: none"> <li>Intermittent claudication is the primary symptom of peripheral arterial disease (PAD), however 50 – 60% of people are asymptomatic.<sup>2</sup></li> <li>Approximately half of those with lower extremity arterial disease are undiagnosed because they are asymptomatic, have atypical symptoms or are assessed using unreliable methods such as pulse palpation or a history of claudication. In addition the incidence of arterial insufficiency increases with age.</li> <li>Ankle Brachial Index (ABI) is a valid and reliable non-invasive test to measure arterial blood flow in the lower legs. It is used, as part of a comprehensive lower leg assessment, to screen clients for the presence and severity of arterial compromise and to identify those clients who require further vascular assessment, as well as being used to predict the healability of lower leg wounds.</li> <li>When planning care, ABI results must always be considered in the context of a comprehensive lower leg assessment and in conjunction with a review of client history.</li> <li>ABI compares the systolic ankle pressure to the systolic brachial pressure using a blood pressure cuff and an 8 megahertz Doppler probe; it is calculated by dividing the higher systolic blood pressure in the ankle by the higher of the two systolic blood pressures in the arms and is expressed as a ratio.</li> <li>ABI may be difficult to perform in the presence of severe edema, lymphedema, and painful or extensive ulcers and may require a 5 megahertz (MHZ) rather than an 8 MHZ Doppler probe.</li> <li>ABI results are 95% sensitive and 95% specific for PAD when measured in a consistent manner.</li> <li>The accuracy of ABI can be affected by the length of the rest period prior to the test, cuff placement, cuff size and the speed of inflation / deflation.</li> <li>An ABI between 0.91 and 1.30 is normal and indicates an absence of arterial disease; ABI less than 0.91 indicate PAD and less than or equal to 0.40 indicates critical ischemia.</li> <li>ABI results greater than 1.30 are falsely high readings and are more common in clients with diabetes, renal failure and in some older adults and are due to calcified, non-compressible blood vessels; clients with an ABI greater than 1.30 should be referred to a physician / NP for further vascular assessment.</li> <li>Due to the high prevalence (&gt; 50%) of arterial calcification in the diabetic population, toe pressures or toe brachial index testing is a more accurate measure of arterial circulation as the arteries of the toes are not as likely to become as calcified as those of the foot.</li> <li>Research has shown a correlation between lower extremity arterial disease and high cholesterol levels, obesity, hypertension, physical inactivity and smoking. Research has also shown that lower extremity arterial disease is an independent predictor of cardiovascular disease. Clients with lower extremity arterial disease are at a much greater risk of stroke, MI and death.</li> </ul>
<b><u>Indications / Precautions / Contraindications</u></b>	<p><b>Indications:</b></p> <ul style="list-style-type: none"> <li>For clients with risk factors for PAD including advanced age, tobacco use, diabetes mellitus, dyslipidemia, elevated lipoproteins, hypertension, chronic renal insufficiency and a family history of PAD.</li> <li>For clients with signs and symptoms of PAD.</li> <li>For clients with lower leg wounds in order to determine presence or absence of arterial compromise, and</li> </ul>

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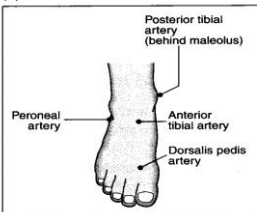
	<p>therefore wound healability, as part of a holistic lower leg assessment.</p> <ul style="list-style-type: none"> <li>• Required as part of a comprehensive lower leg assessment for clients with lower leg edema due to venous insufficiency or lymphedema to determine vascular status prior to initiating any compression wraps or stockings.</li> <li>• Prior to referring clients for a vascular assessment, based on availability of services and agency policy.</li> <li>• To monitor clients following lower leg revascularization procedures.</li> </ul> <p><b>Precautions:</b></p> <ul style="list-style-type: none"> <li>• In the diabetic population there is high prevalence (50%) of medial arterial calcification which can cause a false high ABI result; Toe Pressures / Toe Brachial Index (TBI) rather than an ABI should be considered as TBI tends to be more reliable with arterial calcification.</li> <li>• ABI results may be falsely high if the client cannot lay flat during the test. In this situation refer the client to a wound clinician or physician / NP prior to conducting the test.</li> <li>• Should be done in collaboration with a physician / NP for clients with untreated cellulitis and suspected or untreated DVT.</li> <li>• ABI may be difficult to perform in the presence of severe edema, lymphedema, and painful or extensive ulcers and may require a 5 megahertz (MHZ) rather than an 8 MHZ Doppler probe.</li> </ul> <p><b>Contraindications</b></p> <ul style="list-style-type: none"> <li>• Do not carry out immediately post-op on clients with a superficial bypass graft without first consulting with a physician / NP.</li> <li>• Do not carry out if the client has severe lower leg pain or severe pain associated with a lower leg wound; refer to a wound clinician or physician / NP.</li> <li>• Do not take a BP on the affected side of a client post mastectomy or on an arm with a dialysis fistula.</li> </ul>
<b><u>Definitions</u></b>	<p><b>Ankle Brachial Index (ABI)</b> – A calculated number that indicates the amount of arterial blood flow to the extremity; compares the ankle systolic pressure &amp; the higher of the two brachial systolic pressures with the ABI being a ratio of the two.</p> <p><b>Antecubital Fossa</b> – The triangular area over the inner elbow crease; the brachial artery bifurcates at the base of the fossa.</p>
<b><u>Related Documents</u></b>	<p>Guideline: Assessment and Treatment of Lower Leg Ulcers in Adults          Guideline: Assessment and Treatment of Diabetic and Neuropathic Ulcers in Adults          Procedure: Ankle Brachial Index (ABI) in Adults using an Automatic ABI System          Education Module: Ankle Brachial Index (ABI) Procedure in Adults using Handheld Doppler &amp; Automatic ABI System</p>

### **Equipment and Supplies**

- Doppler Ultrasound with 8 megahertz peripheral probe (or 5 megahertz probe as needed and available)
- Portable manual blood pressure cuff (see Appendix A for cuff sizes)
- Conducting ultrasound gel (KY jelly destroys the probe crystals)
- Clean gloves, if indicated
- Non-adherent low profile cover dressing for wound (if present)
- Facial tissue
- Calculator or ABI graph (see Appendix B)
- Agency approved disinfectant wipe.

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## Procedure

Steps	Key Points
1. Explain procedure to client and have them rest in supine position in a quiet warm room for at least 10 minutes. Remove the client's shoes, socks and compression stockings, if wearing. Roll up sleeves and pant legs. Cover the trunk and lower extremities with a blanket to prevent cooling.	Having the client in a supine position reduces any hydrostatic pressure inaccuracies.
2. Collect equipment & wash hands prior to starting the procedure. Wear clean gloves, if indicated.	Clean gloves should be worn if there is an open area, discharge or a rash on the foot / ankle area.
3. Place appropriate sized blood pressure cuff on the upper arm approximately 1-2 cm above the antecubital fossa.	Select a cuff based on the size of the upper arm: if cuff is too narrow the reading may be a false high; if cuff is too wide the reading may be a false low (see Appendix A).  Repeatedly inflating the cuff or inflating it for long periods may cause the pressure to fall.
4. Palpate brachial pulse and apply gel over the pulse	
5. Turn on the Doppler and hold the Doppler probe at a 45 - 60 degree angle towards the blood flow; move slowly through the gel in circular motion until a pulse sound is heard.	Use of a stethoscope for this step is not recommended as it will alter the accuracy of the index reading.
6. Inflate the BP cuff until the pulse sound disappears and then inflate 10 – 20 mmHg more; do not inflate cuff past 200 mmHg.	Inflating the cuff past 200 mmHg may dislodge plaques in the blood vessels.
7. Gradually deflate the cuff (2 mm / sec) until the arterial sound returns. When the sound is heard completely deflate the cuff. Record the pressure at which the sound returns.	If it is necessary to re-inflate the cuff due to loss of sound, be sure to completely deflate before re-inflating.
8. Repeat steps 3 - 7 on the other arm and use the higher reading of the two systolic arm pressures to calculate the ABI	The higher of the two brachial readings is the true reading. In individuals free of arterial disease there should be $\leq 12$ mmHg inter-arm systolic pressure difference.  If there is a $> 12$ mmHg of inter-arm systolic pressure difference; hold the procedure and contact physician/NP.
9. If an ulcer is present on the lower leg, find the pressure of the unwounded leg first. Cover any leg ulcers that are in close proximity to the cuff with a non-adherent low profile dressing. Apply the BP cuff 1 cm above the lateral malleolus.	A cuff placed higher on the leg may result in higher ankle pressures.  Select a cuff based on the dimension of the leg just above the lateral malleolus; cuff diameter should be 1.2 times the leg diameter; if cuff is too narrow, the reading may be a false high; if cuff is too wide, the reading may be a false low.
10. Locate the dorsalis pedis and posterior tibial pulses in the foot. The peroneal pulse (also known as fibular pulse) may be used if dorsalis pedis or posterior tibial pulse is not found.	 <p>(C)</p>

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Steps	Key Points
11. Using the same method outlined in steps 5 - 7, palpate the dorsalis pedis pulse; apply the gel and using the Doppler determine the dorsalis pedis systolic pressure; do not inflate cuff past 200 mmHg. Deflate the cuff.	<p>If pulse is not palpable, use the Doppler probe in the general area to locate the signal. . If the dorsalis pedis pulse cannot be located, use the posterior tibial pulse to calculate the ABI.</p> <p>If the pulse sound does not disappear at 200 mmHg the blood vessel is calcified causing it to be non-compressible. Refer the client to a physician / NP for further assessment.</p>
12. With the cuff in the same position on the same leg, palpate the posterior tibial pulse, apply the gel and using the Doppler determine the posterior tibial systolic pressure; do not inflate cuff past 200 mmHg. Deflate the cuff.	<p>If pulse is not palpable, use the Doppler probe in the general area to locate the signal. If the posterior tibial pulse cannot be located, use the dorsalis pedis pulse to calculate the ABI.</p> <p>If the pulse sound does not disappear at 200 mmHg the blood vessel is calcified causing it to be non-compressible. Refer the client to a physician / NP for further assessment.</p>
13. Record the higher systolic pressure reading of the two ankle pulses.	<p>If unable to locate the dorsalis pedis use two systolic readings of the posterior tibial pulse to calculate the ABI.</p> <p>Alternately if unable to locate the anterior tibial pulse, use two systolic readings of the dorsalis pedis pulse to calculate the ABI.</p>
14. Remove the gel from the foot.	
15. Repeat steps 9 – 14 on the other leg and record the higher systolic reading of the two ankle pulses.	
16. Wash hands once the procedure is completed. Clean and disinfect the Doppler and probe with a disinfectant / cleaning solution according to the manufacturer's instructions and agency policy.	
17. Calculate the ABI for both the right and left legs by dividing the higher ankle pressure from each leg by the higher systolic brachial pressure from the arms or by using the Ankle Brachial Index Guide in Appendix B.	<p>The higher of the two ankle pressures for that leg</p> <p><b>ABI =</b> -----</p> <p>The higher brachial pressure of the two arms</p>

### Interpretation and Follow-up

1. An ABI between 0.91 and 1.30 indicates the absence of significant arterial disease.
2. An ABI between 0.41 and 0.90 indicates mild to severe arterial compromise and requires referral to a physician / NP for further assessment.
3. An ABI of less than/equal to 0.40 indicates critical leg ischemia and requires immediate physician / NP notification.
4. An ABI greater than / equal to 1.31 indicates calcified arteries which are prevalent in diabetes mellitus; this requires referral to a physician / NP for further vascular assessment e.g Toe Pressures
5. Toe Pressures / Toe Brachial Index (TBI) should be considered for clients with diabetes as this test is more reliable in clients with medial arterial calcification.

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## **Frequency of ABI Reassessment**

As part of a comprehensive Lower Leg assessment, an ABI is reassessed:

- a) every 6 months for clients with a lower leg / foot wound which has a Goal of Treatment of To Heal
- b) every 6 months for clients receiving compression therapy
- c) when either of the following occur:
  - i. Increasing lower leg and/or foot pain unrelated to infection.
  - ii. Increasing signs of arterial insufficiency, e.g. delayed capillary refill, cold skin temperature, absent or diminishing peripheral pulses

## **Documentation**

1. Document initial and ongoing ABI results including Doppler waveforms (where available) as per agency guidelines.
2. Also document any pulses that could not be evaluated and any deviations from the procedure, e.g. unable to lay flat.
3. Document the ABI as a component of a comprehensive Lower Leg Assessment (Link to Lower Leg DST).

## **Bibliography**

1. Al-Qaisi, M., et al. (2009). Ankle Brachial Pressure Index (ABI): An update for practitioners. *Vascular Health and Risk Management*. 5: 833 – 841.
2. American Heart Association: Task Force on Practice Guidelines (2005). Guidelines for the Management of Patients with Peripheral Arterial Disease. Retrieved from [www.PADCoalition.org](http://www.PADCoalition.org)
3. American Diabetes Association. (2003). Peripheral arterial disease in people with diabetes. *Diabetes Care*. 26(12): 3333 – 3341
4. Bonham, P., et al. (2009). What's new in lower-extremity arterial disease? WOCN's 2008 clinical practice guideline. *Journal of Wound Ostomy Continence Nursing*. 36(1): 37 – 44.
5. Burrows, C., et al. (2006). Best practice recommendations for the prevention and treatment of venous leg ulcers: Update 2006. *Wound Care Canada*. 4(1): 45 – 55.
6. Clinical guidelines from Vancouver Island Health Authority (2007), Providence Health Care/ Vancouver Coastal Health (2008), Northern Health (2009), Fraser Health (2008), and Interior Health (2007).
7. Hirsch, A., et al. (2006). ACC / AHA 2005 Practice guidelines for the management of patients with peripheral arterial disease. *Circulation: Journal of the American Heart Association*. 113: e463 – e558. Retrieved from [www.circ.ahajournals.org](http://www.circ.ahajournals.org)
8. Holland, T. (2002). Utilizing the ankle brachial index in practice. *Ostomy Wound Management*. 48(1). Retrieved from [www.o-wm.com/article/81](http://www.o-wm.com/article/81)
9. Kunimoto, B., et al. (2001) Best practices for the prevention and treatment of venous leg ulcers. *Ostomy Wound Management*. 47(2): 34 – 50.
10. Lovell, M., et al. (2009). Peripheral disease: Lack of awareness in Canada. *Canadian Journal of Cardiology*. 25(1): 39 – 45.
11. Park, C., et al. (2011). Ankle-Brachial Index Measurement. Retrieved from <http://emedicine.medscape.com/article/1839449-overview>
12. Peripheral Arterial Disease Coalition. Clinic directory: A cross Canada directory of ankle brachial index (ABI) clinics. Retrieved from [www.ccvsn.ca](http://www.ccvsn.ca)
13. Rudolph, D. (2001). Standards of care for venous leg ulcers: Compression therapy and moist wound healing. *Journal of vascular Nursing*. 19(1): 20 – 27.
14. Sieggreen, M. (2006). A contemporary approach to peripheral arterial disease. *The Nurse Practitioner*. 31(7):14-18, 23-25.
15. Trans – Atlantic Inter-Society Consensus Document on the Management of Peripheral Arterial Disease (TASC II). (2000). Retrieved from [www.tasc-2-pad.org](http://www.tasc-2-pad.org)
16. Vowden, P., et al. (2001). Doppler assessment and ABPI: Interpretation in the management of leg ulceration. Retrieved from [www.worldwidewounds.com/2001/march/Vowden/Doppler-assessment-and-ABPI.html](http://www.worldwidewounds.com/2001/march/Vowden/Doppler-assessment-and-ABPI.html)
17. Worcestershire Health. (2002). Guideline for Doppler ultrasound. Retrieved from [www.worcestershirehealth.nhs.uk/RBPCT\\_Library/lesleyway/Guideline%20for%20Doppler%20Ultrasound.doc](http://www.worcestershirehealth.nhs.uk/RBPCT_Library/lesleyway/Guideline%20for%20Doppler%20Ultrasound.doc)
18. Wound Ostomy and Continence nurses Society. (2012). Ankle Brachial Index Quick reference for clinicians. *Journal of Wound Ostomy Continence Nursing*. 39(2S): S21 – S29.

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**Document Creation/Review**

<b>Created By</b>	British Columbia Provincial Nursing Skin and Wound Committee in collaboration with the Wound Care Clinicians from across all Health Authorities
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## Appendix A: Correct Size BP Cuff for the Arm

Cuff Size	Upper Arm Circumference at Midpoint	
	Centimetres	Inches
Small	22 – 26.9 cm	8.6 - 10.59 inches
Adult	27 – 34.9 cm	10.6 - 13.79 inches
Large Adult	35 – 44.9 cm	13.8 - 17.69 inches
Extra Large (Adult Thigh)	45 – 52 cm	17.7 - 20.47 inches

Based on recommendations from the Agency for Healthcare Research and Quality. Retrieved from <http://www.livingstrong.com/article223392-how-to-choose-a-cuff-size-for-blood-pressure>

**When testing pressures in either the arm or the leg, the cuff width should be at least 1.2 X the diameter of leg.**

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**Appendix B: Ankle Brachial Index Guide <sup>1</sup>**

# Dopplex Ankle Pressure Index (API) Guide

Ankle Pressure (mmHg)

		40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200																												
Brachial Pressure (mmHg)	230	.17	.20	.22	.24	.26	.28	.30	.33	.35	.37	.39	.41	.43	.46	.48	.50	.52	.54	.57	.59	.61	.63	.65	.67	.70	.72	.74	.76	.78	.80	.83	.85	.87	.89	.91	.93	.95	.98	230																						
	225	.18	.20	.22	.24	.27	.29	.31	.33	.36	.38	.40	.42	.44	.47	.49	.51	.53	.56	.58	.60	.62	.64	.67	.69	.71	.73	.76	.78	.80	.82	.84	.86	.89	.91	.93	.95	.98	225																							
	220	.18	.20	.23	.25	.27	.30	.32	.34	.36	.39	.41	.43	.45	.48	.50	.52	.55	.57	.59	.61	.64	.66	.68	.70	.73	.75	.77	.80	.82	.84	.86	.88	.91	.93	.95	.98	220																								
	215	.19	.21	.23	.26	.28	.30	.33	.35	.37	.40	.42	.44	.47	.49	.51	.53	.56	.58	.60	.63	.65	.67	.70	.72	.74	.77	.79	.81	.84	.86	.88	.91	.93	.95	.98	215																									
	210	.19	.21	.24	.26	.29	.31	.33	.36	.38	.40	.43	.45	.48	.50	.52	.55	.57	.60	.62	.64	.67	.69	.71	.74	.76	.79	.81	.83	.86	.88	.90	.93	.95	.98	210																										
	205	.20	.22	.24	.27	.29	.32	.34	.37	.39	.41	.44	.46	.49	.51	.54	.56	.59	.61	.63	.66	.68	.71	.73	.76	.78	.80	.83	.85	.88	.90	.93	.95	.98	205																											
	200	.20	.23	.25	.28	.30	.33	.35	.38	.40	.43	.45	.48	.50	.53	.55	.58	.60	.63	.65	.68	.70	.73	.75	.78	.80	.83	.85	.88	.90	.93	.95	.98	200																												
	195	.21	.23	.26	.28	.31	.33	.36	.38	.41	.44	.46	.49	.51	.54	.56	.59	.62	.64	.67	.69	.72	.74	.77	.79	.82	.85	.87	.90	.92	.95	.97	1.00	1.03	1.05	1.08	1.11	1.14	1.17	1.20	1.23	1.26	1.29	1.33	1.36	1.39	1.43	1.47	1.50	1.54	1.58	1.63	1.67	1.71	1.75	1.79	1.83	1.87	1.91	1.95	1.99	200
	190	.21	.24	.26	.29	.32	.34	.37	.39	.42	.45	.47	.50	.53	.55	.58	.61	.63	.66	.68	.71	.74	.76	.79	.82	.84	.87	.89	.92	.95	.97	1.00	1.03	1.06	1.09	1.12	1.15	1.18	1.21	1.24	1.27	1.30	1.33	1.36	1.39	1.43	1.47	1.50	1.54	1.58	1.63	1.67	1.71	1.75	1.79	1.83	1.87	1.91	1.95	1.99	200	
	185	.22	.24	.27	.30	.32	.35	.38	.41	.43	.46	.49	.51	.54	.57	.59	.62	.65	.68	.70	.73	.76	.78	.81	.84	.86	.89	.92	.94	.97	1.00	1.03	1.06	1.09	1.12	1.15	1.18	1.21	1.24	1.27	1.30	1.33	1.36	1.39	1.43	1.47	1.50	1.54	1.58	1.63	1.67	1.71	1.75	1.79	1.83	1.87	1.91	1.95	1.99	200		
	180	.22	.25	.28	.31	.33	.36	.39	.42	.44	.47	.50	.53	.56	.58	.61	.64	.67	.69	.72	.75	.78	.81	.83	.86	.89	.92	.94	.97	1.00	1.03	1.06	1.09	1.12	1.15	1.18	1.21	1.24	1.27	1.30	1.33	1.36	1.39	1.43	1.47	1.50	1.54	1.58	1.63	1.67	1.71	1.75	1.79	1.83	1.87	1.91	1.95	1.99	200			
	175	.23	.26	.29	.31	.34	.37	.40	.43	.46	.49	.51	.54	.57	.60	.63	.66	.69	.71	.74	.77	.80	.83	.86	.89	.91	.94	.97	1.00	1.03	1.06	1.09	1.12	1.15	1.18	1.21	1.24	1.27	1.30	1.33	1.36	1.39	1.43	1.47	1.50	1.54	1.58	1.63	1.67	1.71	1.75	1.79	1.83	1.87	1.91	1.95	1.99	200				
	170	.24	.26	.29	.32	.35	.38	.41	.44	.47	.50	.53	.56	.59	.62	.65	.68	.71	.74	.76	.79	.82	.85	.88	.91	.94	.97	1.00	1.03	1.06	1.09	1.12	1.15	1.18	1.21	1.24	1.27	1.30	1.33	1.36	1.39	1.43	1.47	1.50	1.54	1.58	1.63	1.67	1.71	1.75	1.79	1.83	1.87	1.91	1.95	1.99	200					
	165	.24	.27	.30	.33	.36	.39	.42	.45	.48	.52	.55	.58	.61	.64	.67	.70	.73	.76	.79	.82	.85	.88	.91	.94	.97	1.00	1.03	1.06	1.09	1.12	1.15	1.18	1.21	1.24	1.27	1.30	1.33	1.36	1.39	1.43	1.47	1.50	1.54	1.58	1.63	1.67	1.71	1.75	1.79	1.83	1.87	1.91	1.95	1.99	200						
	160	.25	.28	.31	.34	.38	.41	.44	.47	.50	.53	.56	.59	.63	.66	.69	.72	.75	.78	.81	.84	.88	.91	.94	.97	1.00	1.03	1.06	1.09	1.13	1.16	1.19	1.22	1.25	1.28	1.31	1.34	1.38	1.41	1.44	1.48	1.51	1.54	1.58	1.63	1.67	1.71	1.75	1.79	1.83	1.87	1.91	1.95	1.99	200							
	155	.26	.29	.32	.35	.39	.42	.45	.48	.52	.55	.58	.61	.65	.68	.71	.74	.77	.81	.84	.87	.90	.94	.97	1.00	1.03	1.06	1.10	1.13	1.16	1.19	1.23	1.26	1.29	1.33	1.36	1.39	1.43	1.47	1.50	1.54	1.58	1.63	1.67	1.71	1.75	1.79	1.83	1.87	1.91	1.95	1.99	200									
	150	.27	.30	.33	.37	.40	.43	.47	.50	.53	.57	.60	.63	.67	.70	.73	.77	.80	.83	.87	.90	.93	.97	1.00	1.03	1.07	1.10	1.13	1.17	1.20	1.23	1.27	1.30	1.33	1.36	1.39	1.43	1.47	1.50	1.54	1.58	1.63	1.67	1.71	1.75	1.79	1.83	1.87	1.91	1.95	1.99	200										
	145	.28	.31	.34	.38	.41	.45	.48	.52	.55	.59	.62	.66	.69	.72	.76	.79	.83	.86	.90	.93	.97	1.00	1.03	1.07	1.11	1.14	1.17	1.21	1.24	1.28	1.31	1.34	1.38	1.41	1.44	1.48	1.51	1.54	1.58	1.63	1.67	1.71	1.75	1.79	1.83	1.87	1.91	1.95	1.99	200											
	140	.29	.32	.36	.39	.43	.46	.50	.54	.57	.61	.64	.68	.71	.75	.79	.82	.86	.89	.93	.96	1.00	1.04	1.07	1.11	1.14	1.18	1.21	1.25	1.29	1.32	1.36	1.39	1.43	1.47	1.50	1.54	1.58	1.63	1.67	1.71	1.75	1.79	1.83	1.87	1.91	1.95	1.99	200													
	135	.30	.33	.37	.41	.44	.48	.52	.56	.59	.63	.67	.70	.74	.78	.81	.85	.89	.93	.96	1.00	1.04	1.07	1.11	1.15	1.19	1.23	1.27	1.31	1.35	1.38	1.42	1.46	1.50	1.54	1.58	1.63	1.67	1.71	1.75	1.79	1.83	1.87	1.91	1.95	1.99	200															
130	.31	.35	.38	.42	.46	.50	.54	.58	.62	.65	.69	.73	.77	.81	.85	.88	.92	.96	1.00	1.04	1.08	1.12	1.15	1.19	1.23	1.27	1.31	1.35	1.38	1.42	1.46	1.50	1.54	1.58	1.63	1.67	1.71	1.75	1.79	1.83	1.87	1.91	1.95	1.99	200																	
125	.32	.36	.40	.44	.48	.52	.56	.60	.64	.68	.72	.76	.80	.84	.88	.92	.96	1.00	1.04	1.08	1.13	1.17	1.21	1.25	1.29	1.33	1.38	1.42	1.46	1.50	1.54	1.58	1.63	1.67	1.71	1.75	1.79	1.83	1.87	1.91	1.95	1.99	200																			
120	.33	.38	.42	.46	.50	.54	.58	.63	.67	.71	.75	.79	.83	.88	.92	.96	1.00	1.04	1.08	1.13	1.17	1.22	1.26	1.30	1.35	1.39	1.43	1.48	1.52	1.57	1.62	1.67	1.71	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.11	2.17	2.22	2.28	2.33	2.38	2.43	2.48	2.53	2.58	2.63	2.68	2.73	2.78	2.83	2.88	2.93	2.98	300			
115	.35	.39	.43	.48	.52	.57	.61	.65	.70	.74	.78	.83	.87	.91	.96	1.00	1.04	1.09	1.13	1.17	1.22	1.26	1.30	1.35	1.39	1.43	1.48	1.52	1.57	1.62	1.67	1.71	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.11	2.17	2.22	2.28	2.33	2.38	2.43	2.48	2.53	2.58	2.63	2.68	2.73	2.78	2.83	2.88	2.93	2.98	300				
110	.36	.41	.45	.50	.55	.59	.64	.68	.73	.77	.82	.86	.91	.95	1.00	1.05	1.09	1.14	1.18	1.23	1.27	1.32	1.36	1.41	1.45	1.50	1.55	1.59	1.64	1.68	1.73	1.77	1.82	1.87	1.91	1.95	2.00	2.05	2.11	2.17	2.22	2.28	2.33	2.38	2.43	2.48	2.53	2.58	2.63	2.68	2.73	2.78	2.83	2.88	2.93	2.98	300					
105	.38	.43	.48	.52	.57	.62	.67	.71	.76	.81	.86	.90	.95	1.00	1.05	1.10	1.14	1.19	1.24	1.29	1.33	1.38	1.43	1.48	1.52	1.57	1.62	1.67	1.71	1.76	1.81	1.86	1.90	1.95	2.00	2.05	2.11	2.17	2.22	2.28	2.33	2.38	2.43	2.48	2.53	2.58	2.63	2.68	2.73	2.78	2.83	2.88	2.93	2.98	300							
100	.40	.45	.50	.55	.60	.65	.70	.75	.80	.85	.90	.95	1.00	1.05	1.10	1.15	1.20	1.25	1.30	1.35	1.40	1.45	1.50	1.55	1.60	1.65	1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.11	2.17	2.22	2.28	2.33	2.38	2.43	2.48	2.53	2.58	2.63	2.68	2.73	2.78	2.83	2.88	2.93	2.98	300									
95	.42	.47	.53	.58	.63	.68	.74	.79	.84	.89	.95	1.00	1.05	1.11	1.16	1.21	1.26	1.32	1.37	1.42	1.47	1.53	1.58	1.63	1.68	1.74	1.79	1.84	1.89	1.95	2.00	2.05	2.11	2.17	2.22	2.28	2.33	2.38	2.43	2.48	2.53	2.58	2.63	2.68	2.73	2.78	2.83	2.88	2.93	2.98	300											
90	.44	.50	.56	.61	.67	.72	.78	.83	.89	.94	1.00	1.06	1.11	1.17	1.22	1.28	1.33	1.39	1.44	1.50	1.56	1.61	1.67	1.72	1.78	1.83	1.89	1.94	2.00	2.06	2.12	2.17	2.22	2.28	2.33	2.38	2.43	2.48	2.																							