THE COLENBRANDER MIXED CONTRAST CARD SET

Background

Conventional, high-contrast letter chart acuity captures only one aspect of visual performance. Low contrast acuity is equally important for activities of daily living, since most everyday objects have less than black-on-white contrast, are larger than the smallest letters seen on a letter chart and are seen at various intermediate distances.

This set of two cards provides a convenient way to include additional measurements:

- It provides additional low-contrast targets. This is important since contrast deficits predict difficulties with activities of daily living and may hint at underlying causes.
- It provides measurements at various intermediate distances. This is important for the assessment of various presbyopia treatments, including multi-focal lenses.
- It also provides text targets. Basic reading assessment is important, since it may show the effect of para-central scotomata that do not yet interfere with central letter acuity.

The card's features include:

- High-contrast (HC) and low-contrast (LC) targets are presented side by side, so that illumination and viewing distance are always identical and comparison is immediate.
- A cord on each card ensures that the viewing distance is maintained accurately. The size of 8.5 x 11 inches (close to A4) is convenient for handheld use.
- The letter test layout follows the rules established by the ETDRS protocol.
- The Visual Acuity Score (VAS) scale provides a convenient linear scale, suitable for comparisons and calculations.
- Three of the four sides provide letter tests, calibrated for use at 40 cm (16"), 63 cm (25") and 100 cm (40"). These distances cover a range that is most important for manual activities of daily living. They require a reading add of 2.5 D, 1.5 D and 1.0 D.
- The fourth side provides lines of text, calibrated for 40 cm. The print sizes follow the standard logarithmic sequence. Each line of text has the same number of characters.

  The texts are available in English, Spanish, Portuguese, French, German, Dutch and Finnish.

Description

All tests provide HC targets on the left and LC targets (10% contrast) on the right. The left-hand margin indicates the letter size in M-units.

M-units are based on Snellen's definition of visual acuity. A 1 M letter subtends 5 min of arc at 1 meter. 1 M = 1.454 mm = almost 1/16 inch (actually 0.9/16 inch).

The right-hand margin indicates the visual acuity value when the card is used at the indicated distance. Visual acuity notations are given in the usual U.S. notation (20/..) and as the decimal equivalent, commonly used in Europe. The Visual Acuity Score notation (VAS) provides a convenient way to compare acuity values. 1 point is added for every letter read correctly; each line read correctly adds 5 points. VAS 100 = 20/20; VAS 50 = 20/200; VAS 0 = 20/2000.

The VAS scale serves the same purpose as the logMAR scale. However, the VAS scale is a scale of performance (higher is better, standard acuity = 100), whereas the logMAR scale is a scale of loss (higher is worse, standard acuity = 0). See the back page for conversion to other notations.
For statistical calculations the recording precision can be enhanced by adding 1 point for every letter read beyond the last line read completely.

Recommendations for use

Standard reading test

Use the left-hand side of the reading card instead of your current reading test.

Reading acuity is typically somewhat less than letter acuity, since letter acuity aims at *threshold* performance, whereas reading acuity aims at *sustainable* performance. Para-central scotomata in AMD that still allow good letter acuity, may yet interfere with reading acuity.

In addition to the letter size in M-units, the left-hand margin indicates the range of Jaeger numbers found on a sample of 20 Jaeger cards. The numbers on Jaeger's original print samples referred to catalogue numbers of the Vienna State Printing House in 1854. As others imitated Jaeger's tests with locally available print sizes, deviations were unavoidable. All current J# sizes were found to be larger than Jaeger's originals. These ranges are listed only to illustrate the inconsistency of J# notation.

From the ranges listed on the card, it can be seen that the J#1 notation was found for print sizes as small as 0.4 M and as large as 0.8 M; the J#6 notation was found for print sizes as small as 0.8 M and as large as 2.5 M. It follows that Jaeger numbers cannot be used for comparative studies.

After asking *"What is the smallest black line you can read?"* it takes little extra time to ask *"What is the smallest gray line you can read?"* This provides information about contrast vision.

For healthy adults the HC-LC difference is usually one or two lines, occasionally three. Larger differences indicate a problem. Among low vision patients differences of 5 or even 10 lines have been found. Finding a low contrast deficit may explain why some patients who still have normal HC acuity yet complain about inadequate vision.

Often such patients have previously been told that "nothing is wrong". Knowing the nature of their contrast problem can be immensely helpful in avoiding low contrast situations (night driving) and in providing more contrast in the home environment.

For use in a Low Vision Service, where contrast losses and lower acuity levels are more common, the more extensive Colenbrander Mixed Contrast Reading Card is recommended.

Severe visual acuity loss

Most conventional charts are accurate for visual acuities down to 20/100; beyond that point most have only 1 or 2 letters at a few letter sizes. The standard ETDRS chart reaches 20/200; beyond that point one must move either the chart or the patient.

The 40 cm letter card allows accurate measurement (5 letters per line) down to 20/400 without the need to move the patient. Thus, guesstimates such as "CF" and "HM" are no longer necessary. Additionally, it allows LC acuity measurement, not possible on conventional charts.

For visual acuities less than 20/400, the range can be extended further by bringing the card closer. Care must be taken to provide the appropriate reading add for each testing distance, especially for elderly patients. In a Low Vision Service, where this level of vision is seen more routinely, the Colenbrander 1-meter card is recommended.

Presbyopia correction

As the correction of presbyopia is expanded from bifocal, trifocal and progressive spectacle lens correction to mono-vision and to various multi-focal lens designs, it is important to verify that these lenses perform as promised, both for HC and LC targets.

For this purpose the letter cards calibrated for 63 cm (25") and 100 cm (40") are provided. The recording sheet provides a simple visual means of comparing the results for different distances. If the two eyes have received different modes of correction or if mono-vision is used, it is important to do the test not only for OD and OS, but also for OU.

RECORDING SHEET FOR THE
COLENBRANDER MIXED CONTRAST CARD SET

Name: _____ Date: _____

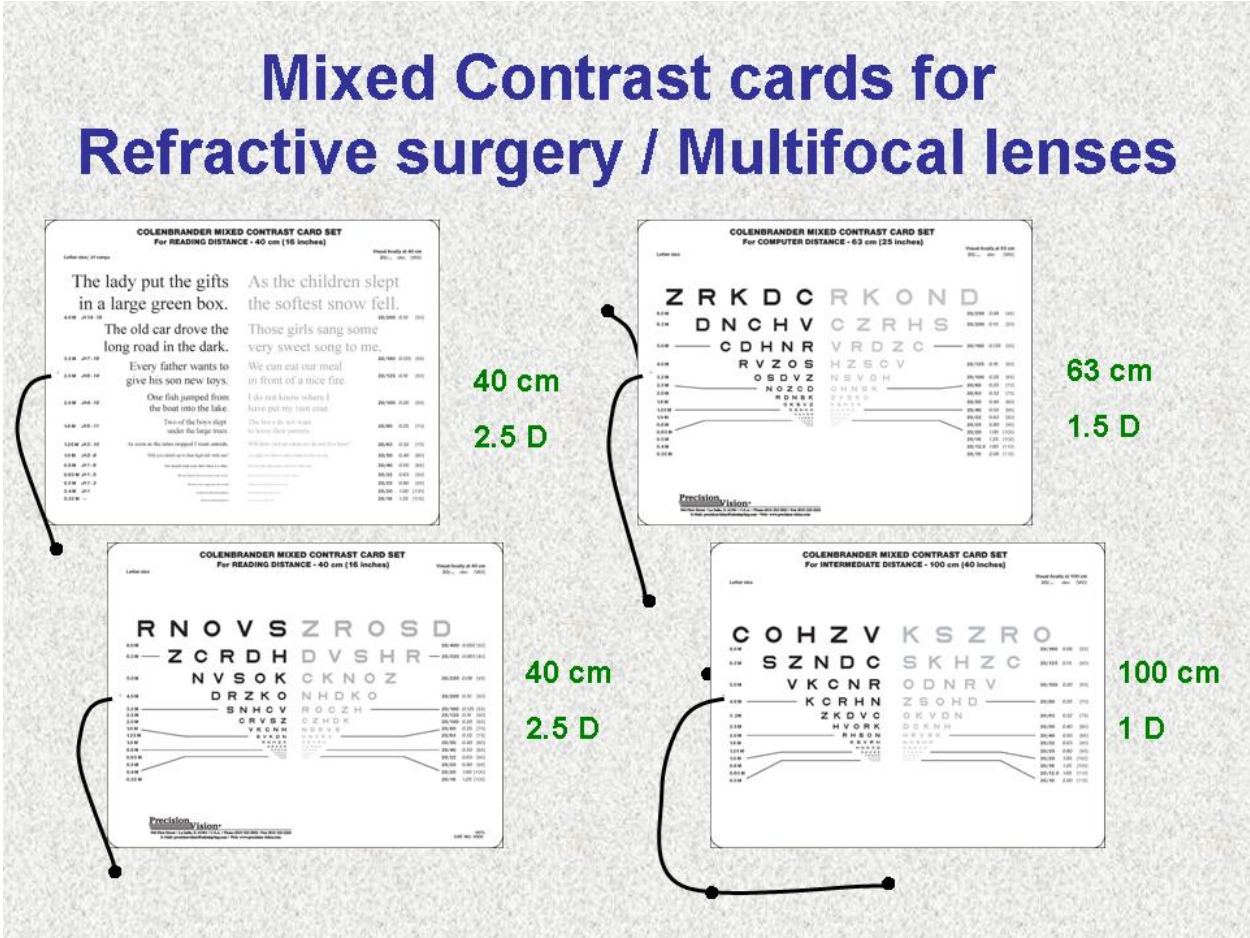
Condition: _____ Age / Sex: _____

Correction: _____ OD OS OU

ICD-9-CM	Visual acuity notations dec.	Visual acuity notations U.S.	Visual Acuity Score	**40 cm** (16”) (reading distance) Text		**40 cm** (16”) (reading distance) Letters		**63 cm** (25”) (computer distance) Letters		**100 cm** (40”) (intermediate dist.) Letters	
Severe loss	0.05	20/400	35			RNOVZ	ZROSD				
	0.063	20/320	40			**ZCRDH**	**DVSHR**				
	0.08	20/250	45			NVOSK	CKNOZ	ZRKDC	RKOND		
	0.10	20/200	50	The lady . .	As the . .	DRZKO	NHDKO	DNCHV	CZRHS		
Moderate	0.125	20/160	55	The old car. .	Those girls . .	**SNHCV**	**ROCZH**	**CDHNR**	**VRDZC**	**COHVZ**	**KSZRO**
	0.16	20/125	60	Every father . .	We can eat . .	CRVSZ	CZHDK	RVZOC	HZSCV	SZNDC	SKHZC
	0.20	20/100	65	One fish . .	I do not . .	VKCNH	NDKVS	OSDVZ	NSVOH	VKCNR	ODNRV
	0.25	20/80	70	Two of the . .	The boys . .	**SVKDN**	**HNCKV**	**NOZCD**	**ONHSK**	**KCRNH**	**ZSOHD**
Mild loss	0.32	20/63	75	As soon as . .	Will they . .	KDHZC	ZSVRC	RDNSK	ZVSKO	ZKDVC	OKVDN
	0.40	20/50	80	Will you . .	At night . .	HZCOR	VCHNS	OKSVZ	KSNDR	HVORK	DCKNH
	0.50	20/40	85	You should . .	Her big . .	**OKDHN**	**OKZRD**	**KSNHO**	**DCZON**	**RHSON**	**HRVSK**
	0.63	20/32	90	My two . .	He has . .	ZONKC	KOSVN	HOVSN	ZVDSO	KSVRH	NOSHR
Normal range	0.80	20/25	95	They have . .	I did not . .	RHSVD	HDRCZ	VCSZH	SOZVR	HNKCD	KROVH
	1.0	20/20	100	She wants . .	He often . .	**DSORZ**	**SVONR**	**CZDRV**	**RNHDC**	**NDOSZ**	**CVDKZ**
	1.25	20/16	105	My new . .	In school . .	KCRHN	ORZCK	SHRZO	VHCND	VRNDO	NHRCK
	1.6	20/12.5	110					DNOKR	CDKRZ	CZHKS	RNCKV
	2.0	20/10	115					**OKDHN**	**RHSVD**	**ORZSK**	**CDNZS**

Comments:

Instructions: In the leftmost block, circle the acuity value found with conventional high-contrast distance testing. In each of the remaining columns circle the last line read. Compare the high-contrast values for different distances. Compare the low-contrast values to the high-contrast value for the same distance. Use the VAS scale to express differences. Each line difference = 5 VAS points.



EQUIVALENT VISUAL ACUITY VALUES

20/…	VAS	logMAR	1 m	2 m	3 m	4 m	5 m	6 m	10 feet
20/1000	[15]	1.7	1/50	2/100	3/150	4/200	5/250	6/300	10/500
20/800	[20]	1.6	1/40	2/80	3/120	4/160	5/200	6/240	10/400
20/630	[25]	1.5	1/32	2/63	3/96	4/125	5/160	6/190	10/320
20/500	[30]	1.4	1/25	2/50	3/75	4/100	5/125	6/150	10/250
20/400	[35]	1.3	1/20	2/40	3/60	4/80	5/100	6/120	10/200
20/320	[40]	1.2	1/16	2/32	3/48	4/63	5/80	6/96	10/160
20/250	[45]	1.1	1/12.5	2/25	3/38	4/50	5/63	6/75	10/125
20/200	[50]	1.0	1/10	2/20	3/30	4/40	5/50	6/60	10/100
20/160	[55]	0.9	1/8	2/16	3/24	4/32	5/40	6/48	10/80
20/125	[60]	0.8	1/6.3	2/12.5	3/19	4/25	5/32	6/38	10/63
20/100	[65]	0.7	1/5	2/10	3/15	4/20	5/25	6/30	10/50
20/80	[70]	0.6	1/4	2/8	3/12	4/16	5/20	6/24	10/40
20/63	[75]	0.5	1/3.2	2/6.3	3/9.5	4/12.5	5/16	6/19	10/32
20/50	[80]	0.4	1/2.5	2/5	3/7.5	4/10	5/12.5	6/15	10/25
20/40	[85]	0.3	1/2	2/4	3/6	4/8	5/10	6/12	10/20
20/32	[90]	0.2	1/1.6	2/3.2	3/4.8	4/6.3	5/8	6/9.5	10/16
20/25	[95]	0.1	1/1.25	2/2.5	3/3.8	4/5	5/6.3	6/7.5	10/12.5
20/20	[100]	0	1/1	2/2	3/3	4/4	5/5	6/6	10/10
20/16	[105]	-0.1	1/0.8	2/1.6	3/2.4	4/3.2	5/4	6/4.8	10/8
20/12.5	[110]	-0.2	1/0.63	2/1.25	3/1.9	4/2.5	5/3.2	6/3.8	10/6.3
20/10	[115]	-0.3	1/0.5	2/1	3/1.5	4/2	5/2.5	6/3	10/5

Note: The Visual Acuity Score [VAS] is used to express differences between visual acuity readings. It increases by 1 point for every letter read correctly (5 points for each line). 20/20 = “100”, 20/200 = “50”. It is the scale used in the AMA *Guides to the Evaluation of Permanent Impairment, 5th edition (2001)*