The Mars Contrast Sensitivity Test

USER MANUAL

<u>Two versions</u>

Mars Letter Contrast Sensitivity Test

Mars Numeral Contrast Sensitivity Test

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Rev 08-21-2021

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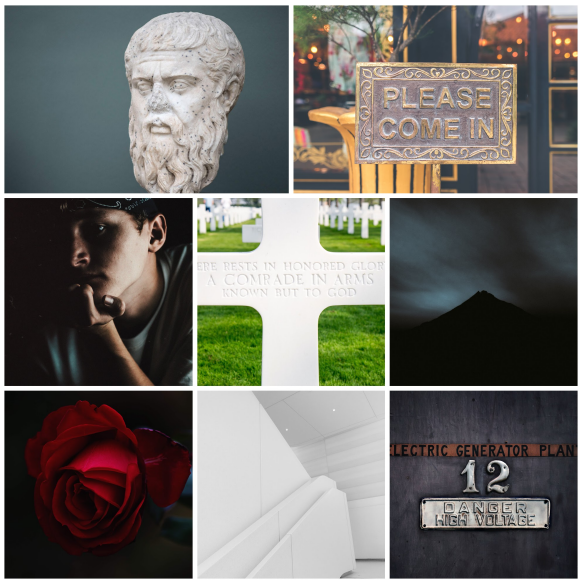
What is the Mars Contrast Sensitivity Test and Why Use It?

The Mars Contrast Sensitivity Test, available in letter and optotype* versions, consists of a set of calibrated, printed charts for assessment of visual contrast perception, and a simple, accurate scoring system. The test provides clinicians, researchers and occupational testers information about the minimum visual *contrast* required to support object perception. Most clinicians and researchers now believe that tests of contrast sensitivity are superior to ordinary visual acuity tests in predicting performance on many visual tasks of everyday life including reading, driving, and recognizing faces. With the Mars test, items gradually decrease in contrast instead of size, and what is evaluated is the minimum contrast a person needs for valid object identification.



Contrast sensitivity testing, a relatively recent advance in clinical and occupational vision assessment, gauges a person's ability to perceive low visual contrasts. Low contrasts are subtle lightness variations in the imagery we see, and they abound in the world around us (see a few examples in the pictures on the right). Contrast sensitivity loss occurs with most age-related eye disorders, including cataracts, glaucoma, and macular disease, and to a lesser degree, with normal aging. In some cases, contrast sensitivity loss occurs without reduction in visual acuity.

Difficulty seeing low contrasts makes performance of many everyday tasks more difficult. Many of these tasks are important for personal safety, employment, and mobility, as well as quality of life activities such as recreational activities, and appreciation of art and natural beauty. For many patients with vision impairment, reduced ability to discern low contrasts is often the perceptual change they notice most. In such cases it is important for clinicians to assess the severity of the loss in relation to patient complaints, to better understand and communicate with them about their visual function experience. Measuring contrast sensitivity with the Mars test provides an objective way to assess worsening or improving contrast vision over time. It is also useful for explaining to patients and their families how their contrast vision has declined, as visual disorders and low vision have progressed—or how they will improve after an intervention like cataract extraction. The Mars test therefore is an essential component in the toolbox of anyone who wants a more complete picture of visual functioning.

Vision professionals of all types (e.g. ophthalmologists, optometrists, orthoptists, occupational and low vision therapists), researchers, and occupational testers use the Mars test to (1) ascertain sufficient contrast sensitivity for specific task performance, such as driver's licensure, (2) establish baseline contrast sensitivity prior to an intervention, such as cataract extraction, (3) assess functional improvement in clinical trials, (4) identify functional losses in low contrast perception, (5) monitor progression of eye conditions, and (6) illustrate the concepts of image contrast and contrast sensitivity to patients and others.

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* The term *optotype* refers to a symbol that is used as a stimulus in testing vision function. Letters and numerals are the most common, but not the only optotypes.

The Mars test's small and portable format makes it ideal for near testing and for use in small office or laboratory spaces, mobile eye clinics, continuum of care settings, and patients' homes. The letter version of the test follows the design practices recommended by the Committee on Vision of the U.S. National Academy of Sciences and the National Research Council, in terms of luminance, optotype, and optotype spacing.[1] It uses the Sloan letter optotype set commonly used in other vision tests such as the Early Treatment Diabetic Retinopathy Study (ETDRS) visual acuity chart.[2] The numeral version of the Mars Contrast Sensitivity Test is identical to the letter version, except that it uses numeral optotypes that replicate the look and geometry of the Sloan optotypes.

The test consists of three different printed test chart forms that are identical except for the sequence of optotypes**,** and a unique scoring method that yields an accurate measure of **log contrast sensitivity (log CS)**. It uses the same familiar letters and numerals used in conventional visual acuity tests, so examinees intuitively and immediately grasp the task they are to perform. Having three forms is especially useful for left eye, right eye and binocular testing. Score sheets for the letter and numeral versions of the test appear on the last two pages of this manual. They can be photocopied, or downloaded and printed from the Mars Perceptrix Corporation web site (http://marsperceptrix.com)

In clinical practice, especially in low vision, those who use the Mars test on a regular basis may wish to use the charts less formally, without scoring, in order to screen patients for specific contrast problems, or to identify patients who might especially benefit from contrast enhancing devices or changes in device settings. For example, a clinician may note that the patient could read, say, only down to the middle of line 5. However, since Mars scoring is so simple, there is little time saved by omitting this step, so full scoring is recommended.

Formal scoring of the test is essential, however, for both occupational testing and research applicat ions. For these uses, all aspects of test administration described in the next section should be followed as precisely and consistently as possible.

To fully characterize contrast sensitivity function, test each eye alone and both eyes together, using different forms of the test for each to minimize item sequence learning effects.

Test Administration

Illumination: For best results, the charts should be illuminated uniformly, optimally with luminance on the chart's white background of 85 cd/m^2. The chart's small size facilitates this, and the lamp on a standard ophthalmic equipment stand or a gooseneck lamp will generally provide sufficient and sufficiently uniform illumination. Other options for providing consistent and even illumination include mounting the charts on a wall with Velcro, or on a table stand, as pictured on the right. Ideally, luminance should be at least 60 and less than 120 cd/m^2 in all white areas of the chart. Luminance is best checked with a photometer. However, if one is not available, an inexpensive incident light meter can be used; illuminance should be in the range 189 to 377 lux, and optimally 267 lux at the chart surface. Testing should not be conducted through any coatings, laminations, or coverings on the chart, even if these are transparent or translucent. If even illumination is difficult to arrange, either the examiner or the examinee may hold the chart by its edges and position it for best

illumination. When examinees hold the chart they generally will spontaneously adjust the chart position during testing and will aim the illumination onto the region containing the items they are trying to identify.

Viewing distance and correction: Testing should be performed with the eyes undilated to ensure a valid refractive state. The examinee's viewing distance should be at or about the customary near refraction distance of 40 cm (15.75 inches), but the test is tolerant of small refractive errors since the letters are large (20/600 equivalent at 40 cm). Examinees should wear their customary reading glasses. Alternatively, they can wear their distance correction supplemented with an additional +2.50 D, using a trial frame or Halberg clip. When testing monocularly, the untested eye should be covered with an occluder, patch, or hand. For patients with very low visual acuity who cannot easily read the highest contrast letters, test distance may be shortened to 20 cm (8 inches), increasing the add, if necessary, to +5.00 D; in this case care must be taken not to allow the patient's head to occlude the light source illuminating the chart.

Testing Instructions

letter version only

1. Tell the examinee that each letter on the chart is either a **C**, **D**, **H**, **K**, **N**, **O**, **R**, **S**, **V**, or **Z**.

2. Instruct the examinee to read the letters from left to right across each line of the chart, and from top to bottom.

numeral version only

1. Tell the examinee that each number on the chart is a single numeral, i.e. either a **0**, **1**, **2**, **3**, **4**, **5**, **6**, **7**, **8**, or **9**.

2. Instruct the examinee to read the numerals from left to right across each line of the chart, and from top to bottom.

both versions

3. Record errors on the score sheet with an X.

4. **Discontinue testing when the examinee has failed to correctly identify two consecutive items.**

Important: If the examinee responds with an item other than one of those allowed, do not score the response as incorrect. Instead, remind the examinee of the allowed items, and ask for another response. This is in order to support the assumption that the probability of a guess is 1/10.

Encourage the examinee to guess even when they report that the letters appear too faint. This is to ameliorate the tendency of some subjects to "give up" before they have reported all the letters or numerals they are actually able to identify, or to be reluctant about giving incorrect answers when they are unsure of what they see. It helps ensure that the score is based on what the examinee *can* see and not on what the examinee *believes* he or she can see. Do not terminate the test because the examinee has given up and has stopped responding. Require the examinee to continue responding, even with guesses. Many times, such guesses reveal sensitivity to items beyond what the examinee believes they can identify. **Terminate testing only when the examinee makes two consecutive errors *or* reaches the end of the chart.**

How to score the test

Scoring is simple. The test stops when the examinee has made two consecutive errors in identification. The log contrast sensitivity (**log CS**) score is simply the value accompanying the **final correct item** on the score sheet, minus a **scoring correction**. (If the examinee reaches the end of the chart without making two consecutive errors, then the final correct item is simply the last letter correctly identified.) The scoring correction is simply a penalty of 0.04 for each item missed prior to the final correct letter.

In the example below, there were no consecutive errors until the examinee failed to correctly identify the **O** at the end of line 6 and the **H** at the beginning of line 7. Thus, the final correct item is the **H** on line 6 with value 1.40. Only one item (the **K** on line 6) was missed prior to that, so only 1 X 0.04 is subtracted as the scoring correction. The final scored log contrast sensitivity is thus 1.36.

Row	FORM 1	Left eye ☑	Right eye ☐	Binocular ☐			
1	C ☐ 0.04	H ☐ 0.08	V ☐ 0.12	O ☐ 0.16	S ☐ 0.20	N ☐ 0.24	
2	D ☐ 0.28	S ☐ 0.32	Z ☐ 0.36	N ☐ 0.40	R ☐ 0.44	K ☐ 0.48	
3	N ☐ 0.52	D ☐ 0.56	R ☐ 0.60	H ☐ 0.64	V ☐ 0.68	Z ☐ 0.72	
4	C ☐ 0.76	S ☐ 0.80	O ☐ 0.84	N ☐ 0.88	K ☐ 0.92	H ☐ 0.96	
5	K ☐ 1.00	N ☐ 1.04	V ☐ 1.08	D ☐ 1.12	S ☐ 1.16	R ☐ 1.20	
6	Z ☐ 1.24	R ☐ 1.28	D ☐ 1.32	K ☒ 1.36	H ☐ 1.40	O ☒ 1.44	
7	H ☒ 1.48	Z ☐ 1.52	C ☐ 1.56	V ☐ 1.60	R ☐ 1.64	K ☐ 1.68	
8	S ☐ 1.72	C ☐ 1.76	Z ☐ 1.80	D ☐ 1.84	V ☐ 1.88	O ☐ 1.92	

Enter value at final correct item 1 1.40

Enter number of errors prior to final correct item 2 1

Multiply line 2 by 0.04 3 0.04

Subtract line 3 from line 1

Log CS Score: 1.36

Score Interpretation

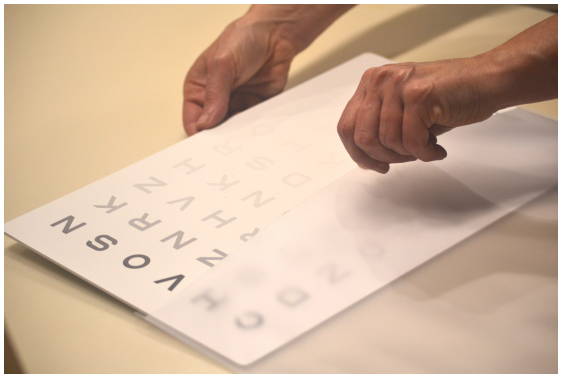
The table below may be used as a rough guide for interpreting log CS scores in relation to severity of contrast sensitivity loss, with the middle column showing severity ranges in terms of test score, and the right column showing severity in terms of which lines the examinee can and cannot read.

Severity	log CS score range	Line-based range
Profound loss	log CS < 0.48	Cannot read to the end of line 2
Severe loss	0.52 ≤ log CS ≤ 1.00	Reads lines 1–2, but cannot read all of lines 3 and 4
Moderate loss	1.04 ≤ log CS ≤ 1.48	Reads lines 1–4 but cannot read beyond line 6
Mild loss (youth and adults ≤ age 60) **No loss** (> age 60)	1.52 ≤ log CS ≤ 1.76	Reads lines 1–6 but cannot read beyond beginning of line 7
No loss	1.72 ≤ log CS ≤ 1.92	Reads beyond lines 1-7

Note that when the two eyes have similar log CS scores, binocular log CS scores may be expected to be about 0.15 higher than monocular log CS scores.

Maintaining Chart Integrity and Longevity

Charts should be stored in their protective sleeves. It is easiest to slip them into their sleeves when both the sleeve and the chart are resting on a table top or other flat surface, as shown in the picture on the right. While the Mars test charts are printed on archival paper, light can nevertheless diminish accuracy of chart contrasts, so when not in use, the sleeved charts should be stored in their storage case to protect them from light, dust, and physical damage. Do not place other objects on the chart surface that can scratch or dent the charts, and try to avoid touching their front surface, especially in the area where the letters are printed. Dust specks can be removed with a soft dry cloth. Never use water or solvents to clean the chart surfaces. With careful use and proper storage, the charts should stay in good condition for years. The test should be replaced if the charts show visible signs of age or damage.



Comparing Letter and Numeral Versions

The letter and numeral versions of the Mars Contrast Sensitivity Test are identical except for the optotype symbols. Here are some reasons why one might choose to test with numeral rather than letter optotypes:

- Many cultures use characters other than those in the Roman alphabet (e.g. those in Asian countries, Arab countries, Greece, and Russia). Numerals, on the other hand, are recognized all over the world and used in everyday transactions in virtually all contemporary cultures.
- Numerals are more "language neutral" in the sense that frequency of occurrence of individual numerals is similar across languages, whereas the distribution of letter frequencies varies substantially depending on language.[3]
- There are only ten Sloan letter optotypes (C, D, H, K, N, O, R, S, V, and Z), but 26 letters in the Roman alphabet. If examinees are presented with Sloan letters but are allowed to give responses that are outside the Sloan letter set, then the assumption of a 1/10 guessing probability is violated, even if those responses are scored as incorrect. Restricting the examinee's responses to Sloan letters is a reasonable solution, but this adds time to instructing and testing the examinee. Since there are only ten numerals (0, 1, 2, 3, 4, 5, 6, 7, 8, and 9), instructing the examinee to respond with a numeral is simpler and better supports the assumption of a single consistent guessing probability than does the use of letter optotypes.

Despite these advantages, letter optotypes are more common than numeral optotypes in vision testing, and when direct comparison with other tests using letters is desired, the Mars letter version will be preferable.

Why the Mars Test is Best

The letter version of the Mars Contrast Sensitivity Test, first described in 2005,[4] is similar to the earlier Pelli-Robson Contrast Sensitivity Chart[5] (PRCSC), and was specifically developed to improve on that earlier design. Both tests use the Sloan letter optotype set first published by Louise Sloan[6] and used in the visual acuity test employed in the Early Treatment Diabetic Retinopathy

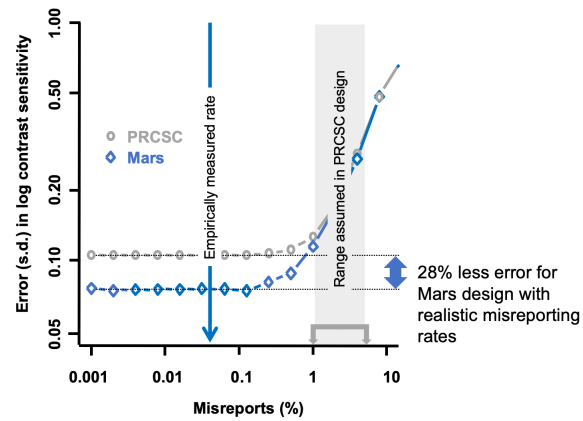
Study.[2] Both tests have optotypes arranged in eight rows of six letters. Visual size of the PRCSC letters at 1 m test distance is 2.8 deg, similar to the 2.5 deg letters of the Mars at 40 cm. Both tests also assess true contrast sensitivity.

The Mars test, however, improves on the PRCSC in six important ways. (1) The Mars test is small, measuring 24 x 36 cm (9.5 x 14 inches), and can be held in the hands, whereas the PRCSC measures 59 cm x 84 cm (23 x 33 inches), and requires wall mounting. (2) The Mars test has 0.04 log unit contrast differences from letter-to-letter (or numeral-to-numeral), as compared to the PRCSC, which has 0.15 log unit gradations. Since the Mars test's scores take on values to the nearest 0.04 log unit, finer differences in contrast sensitivity may be discriminated. (3) The Mars test can be stored and protected after use, whereas the PRCSC is vulnerable to bruises, nicks, dust, and deterioration from constant exposure to light. (4) The Mars test requires even illumination of only 858 cm^2, compared to the 4,956 cm^2 that must be illuminated on the PRCSC (9,912 cm^2 if both PRCSC charts are mounted). (5) The recommended Mars test distance is the same as the one used for standard clinical refraction for reading, so the test can be administered while the patient is already in the examination chair and properly corrected. The PRCSC requires reseating the examinee to a special distance of 1 m (3 ft) distance (from the wall holding the chart). This is a distance that presbyopic patients are not generally corrected to, and so without the use of additional lenses, the chart image may be slightly out of focus during testing. (6) The Mars test is portable and can be used for testing in the home or other remote testing sites.

Because the PRCSC was the first letter contrast sensitivity test, and was used in early studies, many researchers assume that using it will facilitate comparison with other studies. But over the years, the PRCS has undergone many changes that invalidate this assumption. For example, the recommended test distance is now 1 m (3 ft), one-third of the 3 m (10 ft) distance originally recommended.[5] The PRCSC also now tests a sensitivity range that is shifted by 0.05 log unit relative to the original test.[5] But most important are the many changes to test procedures adopted by researchers and other users seeking to increase the test's accuracy. The PRCSC presents letter optotypes in triplets of the same contrast. The manufacturer's instructions state that testing stops when two or more errors are made within a triplet, and the final score is the log CS value of the lowest contrast triplet in which at least two of the letters has been correctly identified. But many (if not most) researchers substitute so called 'letter-by-letter' scoring that gives credit for correct identifications within a triplet.[7] Additionally, many alter the stopping rule. Some stop when there are two or more errors, while others stop the test when all three identifications within a triplet are incorrect. A further complication is that some researchers recommend allowing a response of "O" for a presented "C" to be scored as correct,[8] convoluting interpretation of the guessing probability. These may seem like minor details, but guessing probability, and rules for stopping and scoring are all known to have a big impact on test scores.[4,5] The important point is that the wide variation in PRCSC administration and scoring make it difficult to interpret population data or develop consistent population norms.[4] Because of all these variations in usage, there is no single PRCSC test that has been adopted by consensus in the research community. The Mars test, on the other hand is a single test with a single scoring method, that is inherently more accurate than the PRCSC, as shown in the following analysis.

One of the most important parameters that determines design accuracy of tests like the Mars and PRCSC is the so-called misreporting rate,[4,5] also known as the lapse rate. This parameter is the frequency at which those being tested will misspeak and report a letter other than the one they saw. The original designers of the PRCSC made the assumption (perhaps thinking that verbal reporting would be similar to computer-controlled testing where subjects respond by pressing buttons) that people will misreport at a rate ranging from 1% to 5%. Measurement of the rate using the verbal letter identification task used in letter contrast sensitivity tests however, has shown the PRCSC's design assumption to be off by more than an order of magnitude. The empirically

estimated rate is actually only about 0.05%.[9] The graph at the right shows how test accuracy decreases with higher misreporting rates for both the Mars and the PRCSC (note that lower accuracy is associated with *higher* values on the vertical axis). Both tests show accuracy start to decline rapidly when misreporting is just below 1%. It also shows that both tests have similar, but relatively poor accuracy in the 1–5% misreporting range. But most importantly, it shows that at the negligible rates of misreporting empirically observed using the verbal responses elicited in chart-based testing, the Mars tests (with their much finer contrast gradations and superior scoring method) can be expected to be 28% more accurate than the PRCSC.



Thus, the Mars test has improved accuracy and simpler scoring, as well as being more convenient to use in clinical settings.

Specifications

Each Mars chart measures 9.5 x 14 inches (24.1 x 35.6 cm). Optotypes are composed within a 1.75 cm square box, which at 15.75 inches (40 cm) viewing distance, subtends 2.5 deg of visual angle. Each form consists of 48 optotypes, arranged in eight rows of six. The contrast of each optotype, reading from left to right, and continuing on successive lines on each chart, decreases by a constant factor of 0.04 log unit, or 0.912 from the reference contrast of 1.0. The highest contrast optotype on each of the Mars chart forms (at row 1, column 1) has a contrast of 0.912, and the lowest (at row 8, column 6), has a contrast of 0.012. The table below shows the contrast values of all the letters or numerals on each Mars form. Contrast (C) is defined as

$$C = \frac{R_{fg} - R_{bg}}{R_{bg}},$$

where R_{fg} and R_{bg} are the reflectances of the image foreground (the printed letter or numeral) and background (the white background), respectively. If threshold contrast is C, then log contrast sensitivity ($log\ CS$) associated with each contrast value is $-\log_{10} C$.

Column⇒	1		2		3		4		5		6	
Row ⇓	$log\ CS$	C	$log\ CS$	C	$log\ CS$	C	$log\ CS$	C	$log\ CS$	C	$log\ CS$	C
1	0.04	0.912	0.08	0.832	0.12	0.759	0.16	0.692	0.20	0.631	0.24	0.575
2	0.28	0.525	0.32	0.479	0.36	0.437	0.40	0.398	0.44	0.363	0.48	0.331
3	0.52	0.302	0.56	0.275	0.60	0.251	0.64	0.229	0.68	0.209	0.72	0.191
4	0.76	0.174	0.80	0.158	0.84	0.145	0.88	0.132	0.92	0.120	0.96	0.110
5	1.00	0.100	1.04	0.091	1.08	0.083	1.12	0.076	1.16	0.069	1.20	0.063
6	1.24	0.058	1.28	0.052	1.32	0.048	1.36	0.044	1.40	0.040	1.44	0.036
7	1.48	0.033	1.52	0.030	1.56	0.028	1.60	0.025	1.64	0.023	1.68	0.021
8	1.72	0.019	1.76	0.017	1.80	0.016	1.84	0.014	1.88	0.013	1.92	0.012

All three forms in each version of the test have the same set of contrasts, with only the letters or numerals on each chart varying. For example, the contrast of the optotype in row 4, column 2 is 0.158. Reading correctly only to that letter is associated with a log CS score of 0.80.

How to Cite the Mars Test in Published Works

If you use the Mars Test in your research or other publications, please cite Refence 4 below (shown in **bold**).

Literature Cited

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The Mars Letter Contrast Sensitivity Test
Score Sheet

Examinee _____ **Date** _____

Correction _____ Test distance _____ Administered by _____

Comments _____

Instruct examinee to read letters left to right for each line, from top to bottom of the chart

Important: Allow *only* the letters C D H K N O R S V Z as responses.

Mark errors with an "X." Stop testing after **two** consecutive errors.

Row	FORM 1 Left eye ☐ Right eye ☐ Binocular ☐					
1	C ☐ 0.04	H ☐ 0.08	V ☐ 0.12	O ☐ 0.16	S ☐ 0.20	N ☐ 0.24
2	D ☐ 0.28	S ☐ 0.32	Z ☐ 0.36	N ☐ 0.40	R ☐ 0.44	K ☐ 0.48
3	N ☐ 0.52	D ☐ 0.56	R ☐ 0.60	H ☐ 0.64	V ☐ 0.68	Z ☐ 0.72
4	C ☐ 0.76	S ☐ 0.80	O ☐ 0.84	N ☐ 0.88	K ☐ 0.92	H ☐ 0.96
5	K ☐ 1.00	N ☐ 1.04	V ☐ 1.08	D ☐ 1.12	S ☐ 1.16	R ☐ 1.20
6	Z ☐ 1.24	R ☐ 1.28	D ☐ 1.32	K ☐ 1.36	H ☐ 1.40	O ☐ 1.44
7	H ☐ 1.48	Z ☐ 1.52	C ☐ 1.56	V ☐ 1.60	R ☐ 1.64	K ☐ 1.68
8	S ☐ 1.72	C ☐ 1.76	Z ☐ 1.80	D ☐ 1.84	V ☐ 1.88	O ☐ 1.92

Enter value at final correct item 1____

Enter number of errors prior to final correct item 2____

Multiply line 2 by 0.04 3____

Subtract line 3 from line 1

Log CS Score: ____

Row	FORM 2 Left eye ☐ Right eye ☐ Binocular ☐					
1	K ☐ 0.04	S ☐ 0.08	H ☐ 0.12	O ☐ 0.16	N ☐ 0.20	C ☐ 0.24
2	Z ☐ 0.28	D ☐ 0.32	C ☐ 0.36	R ☐ 0.40	V ☐ 0.44	O ☐ 0.48
3	C ☐ 0.52	K ☐ 0.56	O ☐ 0.60	N ☐ 0.64	R ☐ 0.68	S ☐ 0.72
4	N ☐ 0.76	S ☐ 0.80	Z ☐ 0.84	K ☐ 0.88	H ☐ 0.92	D ☐ 0.96
5	H ☐ 1.00	N ☐ 1.04	C ☐ 1.08	O ☐ 1.12	R ☐ 1.16	Z ☐ 1.20
6	V ☐ 1.24	K ☐ 1.28	S ☐ 1.32	N ☐ 1.36	D ☐ 1.40	R ☐ 1.44
7	K ☐ 1.48	R ☐ 1.52	V ☐ 1.56	Z ☐ 1.60	O ☐ 1.64	S ☐ 1.68
8	V ☐ 1.72	Z ☐ 1.76	C ☐ 1.80	D ☐ 1.84	V ☐ 1.88	H ☐ 1.92

Enter value at final correct item 1____

Enter number of errors prior to final correct item 2____

Multiply line 2 by 0.04 3____

Subtract line 3 from line 1

Log CS Score: ____

Row	FORM 3 Left eye ☐ Right eye ☐ Binocular ☐					
1	H ☐ 0.04	R ☐ 0.08	Z ☐ 0.12	V ☐ 0.16	C ☐ 0.20	N ☐ 0.24
2	S ☐ 0.28	O ☐ 0.32	K ☐ 0.36	D ☐ 0.40	R ☐ 0.44	S ☐ 0.48
3	K ☐ 0.52	D ☐ 0.56	C ☐ 0.60	V ☐ 0.64	O ☐ 0.68	H ☐ 0.72
4	N ☐ 0.76	S ☐ 0.80	O ☐ 0.84	Z ☐ 0.88	C ☐ 0.92	D ☐ 0.96
5	R ☐ 1.00	H ☐ 1.04	N ☐ 1.08	K ☐ 1.12	Z ☐ 1.16	O ☐ 1.20
6	C ☐ 1.24	R ☐ 1.28	S ☐ 1.32	V ☐ 1.36	K ☐ 1.40	N ☐ 1.44
7	S ☐ 1.48	K ☐ 1.52	R ☐ 1.56	N ☐ 1.60	H ☐ 1.64	D ☐ 1.68
8	C ☐ 1.72	V ☐ 1.76	H ☐ 1.80	D ☐ 1.84	O ☐ 1.88	Z ☐ 1.92

Enter value at final correct item 1____

Enter number of errors prior to final correct item 2____

Multiply line 2 by 0.04 3____

Subtract line 3 from line 1

Log CS Score: ____

mars perceptrix

The Mars Numeral Contrast Sensitivity Test

Score Sheet

Examinee _____ **Date** _____

Correction _____ Test distance _____ Administered by _____

Comments _____

Instruct examinee to read numerals left to right for each line, from top to bottom of the chart

Important: Allow *only* the numerals 0 1 2 3 4 5 6 7 8 9 as responses.

Mark errors with an "X." Stop testing after **two** consecutive errors.

Row	FORM 1 Left eye ☐ Right eye ☐ Binocular ☐					
1	0 ☐ 0.04	2 ☐ 0.08	8 ☐ 0.12	5 ☐ 0.16	7 ☐ 0.20	4 ☐ 0.24
2	1 ☐ 0.28	7 ☐ 0.32	9 ☐ 0.36	4 ☐ 0.40	6 ☐ 0.44	3 ☐ 0.48
3	4 ☐ 0.52	1 ☐ 0.56	6 ☐ 0.60	2 ☐ 0.64	8 ☐ 0.68	9 ☐ 0.72
4	0 ☐ 0.76	7 ☐ 0.80	5 ☐ 0.84	4 ☐ 0.88	3 ☐ 0.92	2 ☐ 0.96
5	3 ☐ 1.00	4 ☐ 1.04	8 ☐ 1.08	1 ☐ 1.12	7 ☐ 1.16	6 ☐ 1.20
6	9 ☐ 1.24	6 ☐ 1.28	1 ☐ 1.32	3 ☐ 1.36	2 ☐ 1.40	5 ☐ 1.44
7	2 ☐ 1.48	9 ☐ 1.52	0 ☐ 1.56	8 ☐ 1.60	6 ☐ 1.64	3 ☐ 1.68
8	7 ☐ 1.72	0 ☐ 1.76	9 ☐ 1.80	1 ☐ 1.84	8 ☐ 1.88	5 ☐ 1.92

Enter value at final correct item 1____

Enter number of errors prior to final correct item 2____

Multiply line 2 by 0.04 3____

Subtract line 3 from line 1

Log CS Score: ____

Row	FORM 2 Left eye ☐ Right eye ☐ Binocular ☐					
1	3 ☐ 0.04	7 ☐ 0.08	2 ☐ 0.12	5 ☐ 0.16	4 ☐ 0.20	0 ☐ 0.24
2	9 ☐ 0.28	1 ☐ 0.32	0 ☐ 0.36	6 ☐ 0.40	8 ☐ 0.44	5 ☐ 0.48
3	0 ☐ 0.52	3 ☐ 0.56	5 ☐ 0.60	4 ☐ 0.64	6 ☐ 0.68	7 ☐ 0.72
4	4 ☐ 0.76	7 ☐ 0.80	9 ☐ 0.84	3 ☐ 0.88	2 ☐ 0.92	1 ☐ 0.96
5	2 ☐ 1.00	4 ☐ 1.04	0 ☐ 1.08	5 ☐ 1.12	6 ☐ 1.16	9 ☐ 1.20
6	8 ☐ 1.24	3 ☐ 1.28	7 ☐ 1.32	4 ☐ 1.36	1 ☐ 1.40	6 ☐ 1.44
7	3 ☐ 1.48	6 ☐ 1.52	8 ☐ 1.56	9 ☐ 1.60	5 ☐ 1.64	7 ☐ 1.68
8	8 ☐ 1.72	9 ☐ 1.76	0 ☐ 1.80	1 ☐ 1.84	8 ☐ 1.88	2 ☐ 1.92

Enter value at final correct item 1____

Enter number of errors prior to final correct item 2____

Multiply line 2 by 0.04 3____

Subtract line 3 from line 1

Log CS Score: ____

Row	FORM 3 Left eye ☐ Right eye ☐ Binocular ☐					
1	2 ☐ 0.04	6 ☐ 0.08	9 ☐ 0.12	8 ☐ 0.16	0 ☐ 0.20	4 ☐ 0.24
2	7 ☐ 0.28	5 ☐ 0.32	3 ☐ 0.36	1 ☐ 0.40	6 ☐ 0.44	7 ☐ 0.48
3	3 ☐ 0.52	1 ☐ 0.56	0 ☐ 0.60	8 ☐ 0.64	5 ☐ 0.68	2 ☐ 0.72
4	4 ☐ 0.76	7 ☐ 0.80	5 ☐ 0.84	9 ☐ 0.88	0 ☐ 0.92	1 ☐ 0.96
5	6 ☐ 1.00	2 ☐ 1.04	4 ☐ 1.08	3 ☐ 1.12	9 ☐ 1.16	5 ☐ 1.20
6	0 ☐ 1.24	6 ☐ 1.28	7 ☐ 1.32	8 ☐ 1.36	3 ☐ 1.40	4 ☐ 1.44
7	7 ☐ 1.48	3 ☐ 1.52	6 ☐ 1.56	4 ☐ 1.60	2 ☐ 1.64	1 ☐ 1.68
8	0 ☐ 1.72	8 ☐ 1.76	2 ☐ 1.80	1 ☐ 1.84	5 ☐ 1.88	9 ☐ 1.92

Enter value at final correct item 1____

Enter number of errors prior to final correct item 2____

Multiply line 2 by 0.04 3____

Subtract line 3 from line 1

Log CS Score: ____

mars perceptrix