Study Guide

For Placement into Math 30-2 (MATH 162)

Important Information

The Math Placement test is a free assessment designed for Academic Upgrading placement purposes only. No section of the test may be used for admission to any SAIT program other than Academic Upgrading. The Math Placement Test is not accepted for admission to any other institution.

- The passing mark required for eligibility to register in Math-162 (Math 30-2) is 60%.
- We aim to put students' passing marks on our system within 2 business days of successful completion of the test.
- Students who have been accepted into the Academic Upgrading program can register for the course they are placed into once we have granted them permission based on their passing grades.
- Students who have already taken and passed SAIT's Academic Upgrading courses in Math and Physics ARE NOT required to take a placement test.

Math Placement Study Guide

This study guide is designed to prepare students for the Academic Upgrading Math Placement test for entry into Math-162 (Math 30-2). Please use the following grade 11 (Math 20-2) practice exercises to prepare for your online placement test to meet eligibility for Math 30-2. An answer key is included at the end of this guide.
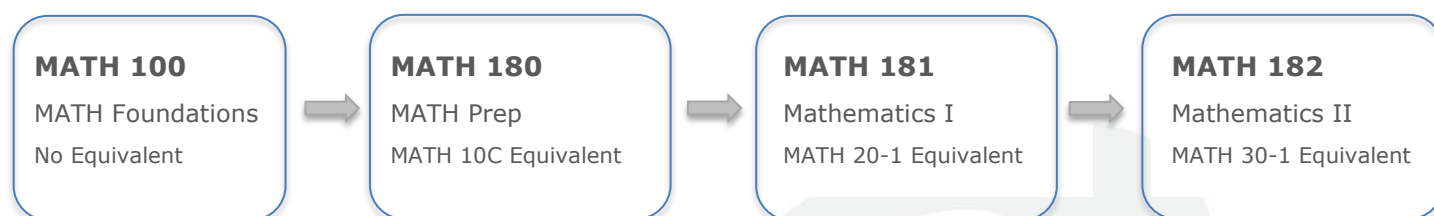
This test is for placement into grade Math 30-2 equivalency (Math 162):

- The study guide consists of 15 questions for practice. The actual test will also consist of 15 questions.
- **A scientific calculator is required. Graphing calculator is permitted but not required for the statistics-based questions.** You may use the Z-score table for those question in place of a graphing calculator as necessary.
- You will be provided with a formula sheet, which is also provided in this guide.
- Students should allow for 60 minutes to complete the test. An additional 30 minutes has been added to allow for accommodated time, for a total test time of 90 minutes.

- A passing mark of 60% or greater is required in this test for eligibility to register in Math 162.
- This test is to be written in the Testing Centre.

SAIT Academic Upgrading Course Sequence

MATH 100

MATH Foundations

No Equivalent

→

MATH 180

MATH Prep

MATH 10C Equivalent

→

MATH 181

Mathematics I

MATH 20-1 Equivalent

→

MATH 182

Mathematics II

MATH 30-1 Equivalent

Note: MATH 100 is not transferable outside of SAIT. MATH 180, MATH 181, and MATH 182 are accepted as admission requirements at other post-secondary institutions in Alberta, but you should always check with the post-secondary institution you are interested in attending (if it is not SAIT) to confirm it will accept the courses.

Note: SAIT also offers **MATH 162 (Mathematics 30-2 equivalent)** as an evening online course only. This course is acceptable for admission at SAIT and other colleges and polytechnics across Alberta, but not necessarily degree-granting institutions (refer to www.acat.gov.ab.ca for more information). Please talk to an upgrading advisor for more information.

Please review your future program's math admission requirements on SAIT.ca to determine which math stream is most suitable for your needs.

For more details about these courses or the required testing scores to place into them, contact upgrading@sait.ca or 403-210-5756.

# Grade 11 (Math 20-2) Material: Mathematic Exercises

The below will be similar to what you will be tested on for the placement test into Math 30-2 equivalency (Math 162).

1. A quadratic function is given by the equation, $h(x) = 3x^2 + 12x - 15.$ Determine the domain and range of the function, $h(x)$.

2. Given the coordinate grid below, sketch the quadratic function, $y = \frac{1}{2}(x-3)^2 - 2.$
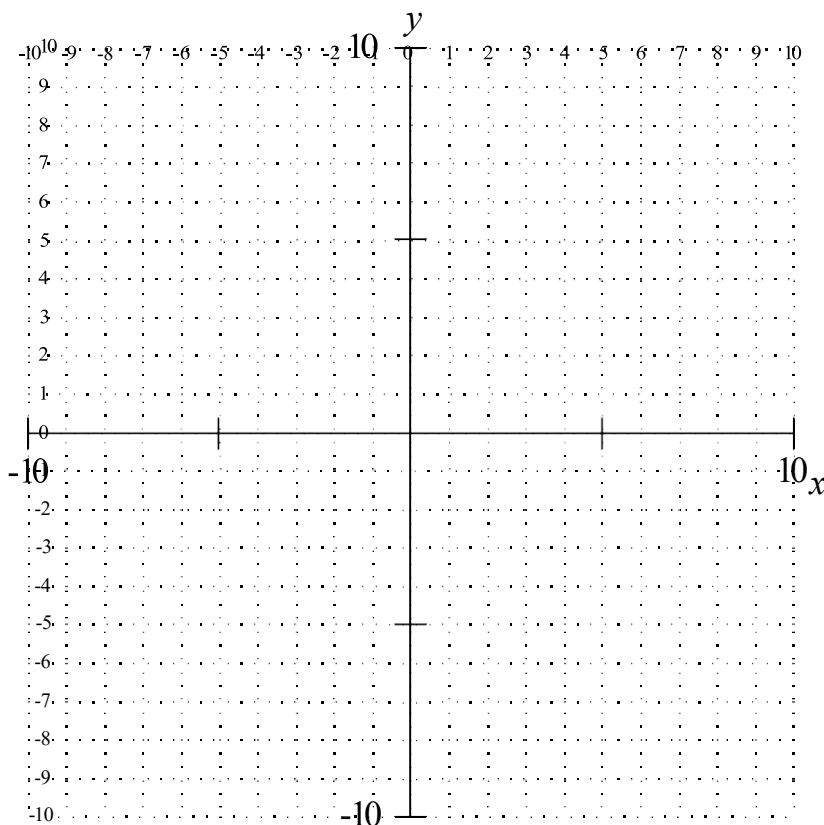
3. Consider the quadratic function, $y = -6x^2 - 3x + 18$. If the equation of the axis of symmetry is $x = -0.25$, determine the coordinates of the vertex of the graph.
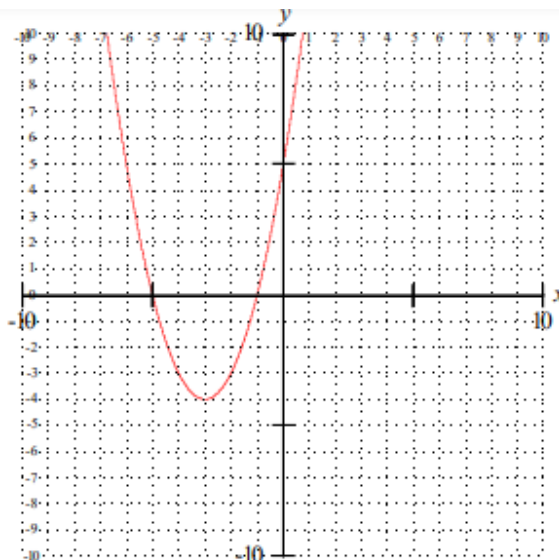
4. What are the domain and range of the function given in the graph above?

   a. $\{x\,|\,x \in R\},\{y\,|\,y \in R\}$

   b. $\{x\,|\,x \in R\},\{y\,|\,y \geq -4, y \in R\}$

   c. $\{x\,|\,x \geq -4, x \in R\},\{y\,|\,y \in R\}$

   d. $\{x\,|\,x \in R\},\{y\,|\,y > 4, y \in R\}$

5. Determine the exact value of the following expression and record your answer as a mixed radical:

$$\sqrt{30} \times 2\sqrt{6}$$

6. Determine the exact value of the following expression and record your answer as a mixed radical:

$$\frac{3\sqrt{40}}{\sqrt{12}}$$

7. Determine the exact value of the following expression and record your answer as a mixed radical:

$$\frac{-\sqrt{20}}{\sqrt{3}-\sqrt{2}}$$

8. Surveyors are measuring a rectangular building site and determine its dimensions to be 175m×50m wide. If a scale drawing of the land is constructed and is 70cm×20cm, what is the scale factor for the drawing?

9. A can of pop (a cylinder) is 12.0cm tall and has a diameter of 5.5cm. An enlarged model of the pop can is to be constructed. The scale ratio to be used in the construction is 1:45. What will the enlarged model's height and diameter be and what will the ratio between the enlarged model's volume and the actual volume be?

10. What is the value of x for the triangle given to the right?

    a. 2.4cm
    b. 4.2cm
    c. 17.5cm
    d. 30.0cm

    x

    16.1 cm

    15°   15.9 cm
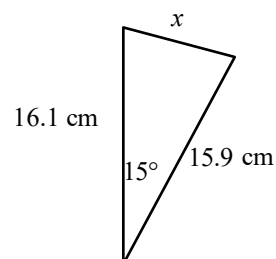
11. If $\overline{AB} \parallel \overline{CD}$, then which of the following statements concerning angles a through f is true in the diagram below?

B   D

a / b   c / d
e / f   g / h

A   C
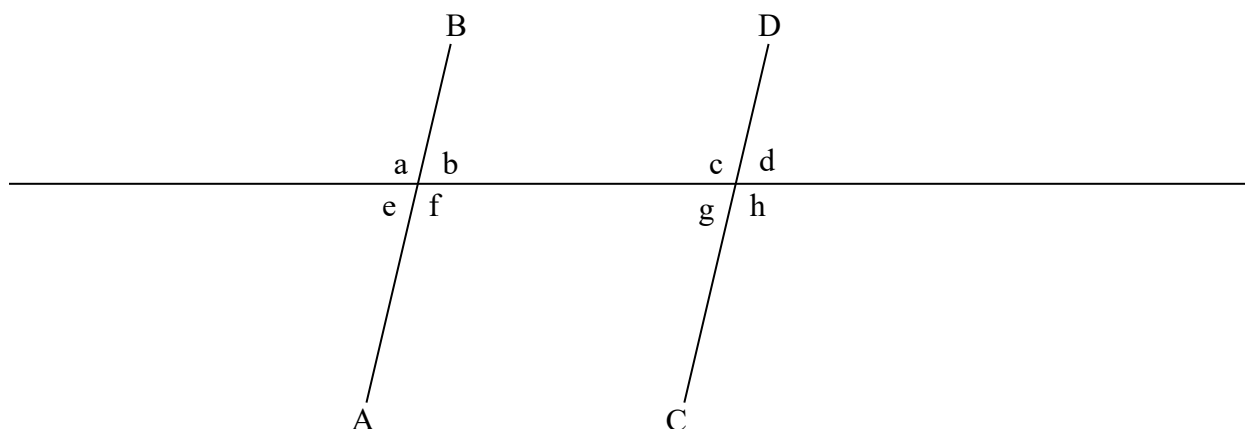
A. $a = f = c = h$

B. $e = b = c = h$
C. $a = b = c = d$
D. $a = b = g = h$

12. From the top of a tall cliff an observer sees two boats, one directly behind the other, heading for the shore. The angle of depression from the observer to the boat farthest from the observer is 42° and the angle of depression to the nearer boat is 51°. If the distance between the observer and the closest boat is 125m, calculate, to the nearest meter, the distance between the boats. Your solution must include a clearly labelled diagram.

13. A student plans to make an open box from a sheet of cardboard by cutting squares from each corner, and then turning up the four flaps. The box is to be 3.0cm deep and 15.0cm longer than it is wide. Its volume is to be 55.0cm^3. Find the dimensions of the box to the nearest tenth of a cm.

14. The height of Canadian adult females is normally distributed with a mean of 162 cm and a standard deviation of 9.4 cm. Determine the **minimum** height, to the nearest centimeter, a person could be and still be within the top 8%.

15. Students' scores on a final exam are normally distributed with a mean of 62% and a standard deviation of 5%. The instructor adjusts the marks so that the new mean is 70%, the new standard deviation is 10%, and the z-scores are unchanged. If Ahmed's original mark was 75%, then, to the nearest percent, determine his adjusted mark.

Study Guide for Placement into Math 30-2 Equivalency (Math 162): Answer Key

Question 1:

$h(x) = (3x - 3)(x + 5)$ **therefore x-intercepts are x=1 and x=-5**
The vertex must have an x-coordinate of x=-2
$$h(-2) = 3(-2)^2 + 12(-2) - 15$$

$h(-2) = -27,$ **this is the minimum, so** $\begin{cases} x/ \ x \in R \\ y/ \ y \geq -27, y \in R \end{cases}$

Question 2:
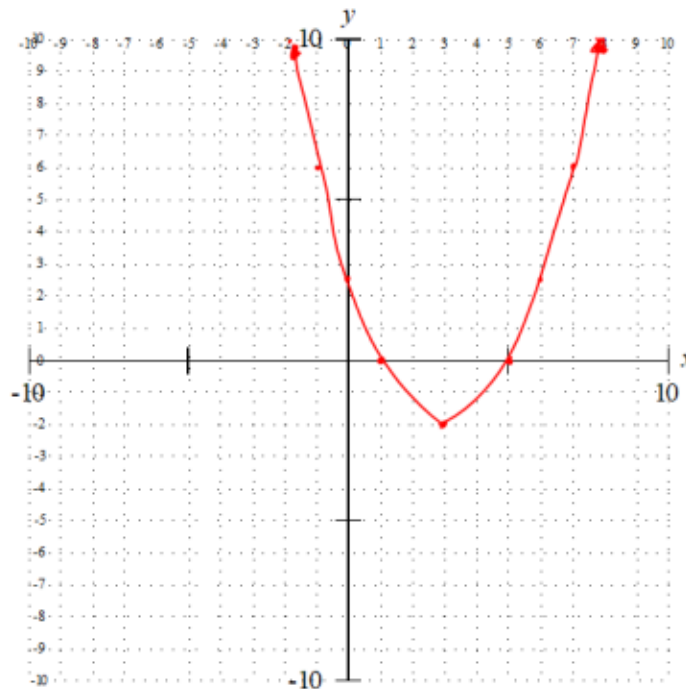
Question 3:

$$y(-0.25) = -6(-0.25)^2 - 3(-0.25) + 18$$
$$y(-0.25) = 18.375$$
Vertex: (-0.25, 18.375)

Question 4:

$$\{x \mid x \in R\}, \{y \mid y \geq -4, y \in R\}$$

Question 5:

$$= 2\sqrt{180}$$

$$= 2 \times 6\sqrt{5}$$

$$= 12\sqrt{5}$$

Question 6:

$$= 3\sqrt{\frac{40}{12}}$$

$$= 3\sqrt{\frac{10}{3}}$$

Question 7:

$$\frac{-\sqrt{20}}{\sqrt{3}-\sqrt{2}} \times \frac{(\sqrt{3}+\sqrt{2})}{\sqrt{3}+\sqrt{2}}$$

$$= \frac{-(\sqrt{60}+\sqrt{40})}{3-2}$$

$$= -(2\sqrt{15}+2\sqrt{10})$$

$$= -2(\sqrt{15}+\sqrt{10})$$

Question 8:

$$(175\,m)x = 0.7\,m$$

$$and\ (50\,m)\,x = 0.2\,m$$

$$x = 0.7/175$$
$$x = 0.2/50$$

$$x = \frac{1}{250}$$

Question 9:

height = (12.0 cm)

height = 540 cm

diameter = (5.5 cm)

diameter = 247.5 cm

The volume of the enlarged model will be 45³

Times. The original volume is 285.09 cm³

The Enlarged volume is 25 979 694.9 *cm³*. The Ratio is 1:91280.

Question 10:

a. 2.4cm
b. 4.2cm
c. 17.5cm
d. 30.0c
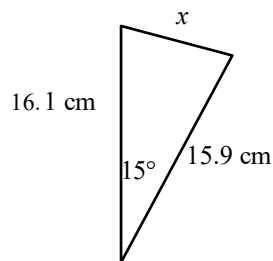
$x = \sqrt{(16.1)^2 + (15.9)^2 - 2(16.1)(15.9)\cos(15)} = 4.18 \approx 4.2$

16.1 cm

15.9 cm

15°

x

Question 11.

B D

a b   c d
e f   g h

A   C

A. $a = f = c = h$

B. $e = b = c = h$
C. $a = b = c = d$
D. $a = b = g = h$

Study Guide for Placement into Math 30-2 Equivalency (Math 162)
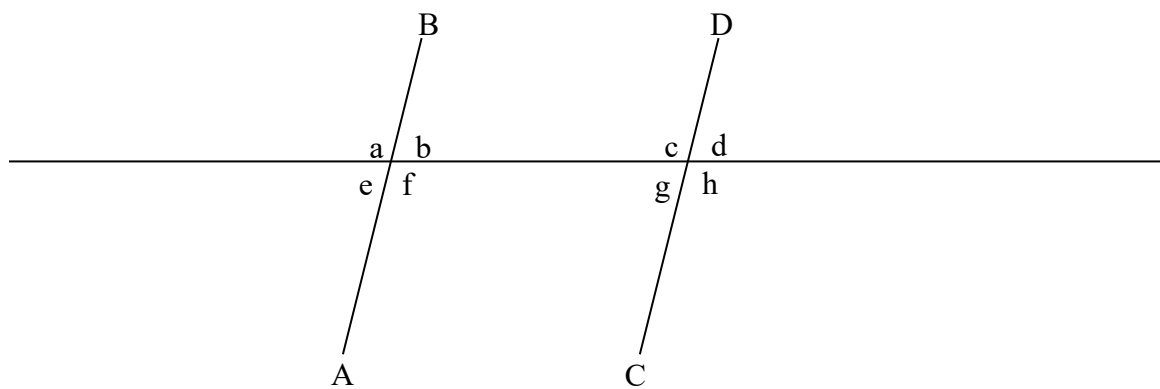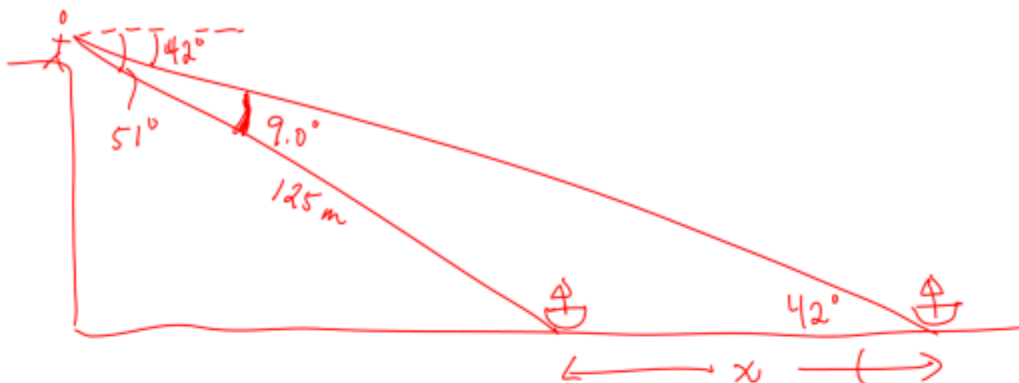
Question 12.

$$\frac{\sin 42°}{125 \, m} = \frac{\sin 9°}{x}$$

$$x = 125 \, m \times \frac{\sin 9°}{\sin 42°}$$

$$x = 29 \, m$$

Question 13.
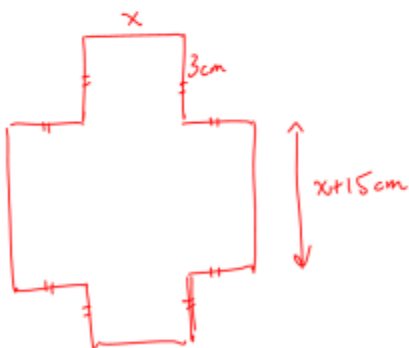
$$V = 3x \, (x + 15)$$

$$55 = 3x^2 + 45x$$

$$3x^2 + 45x - 55 = 0$$

$$x = \frac{-45 \pm \sqrt{45^2 - 4(3)(55)}}{2(3)}$$

$$x = \frac{-45 \pm \sqrt{2685}}{6}$$

$$x = -16.1 \, cm \,\, (not \,\, possible \,\, in \,\, this \,\, case) \,\, or \,\, x = 1.1 \, cm$$

$$\therefore x = 1.1 \, cm$$

Question 14.

$$invNorm\ (0.92, 162, 9.4)\ =\ 175.2\ cm$$

$$\therefore\ minimum\ height\ =\ 176\ cm$$

Question 15.

$$Z.Score\ =\ \frac{75\% - 62\%}{5\%}$$

$$Z.Score\ =\ 2.6$$

$$Z.Score\ =\ \frac{New\ mark - Mean\ mark}{Standard\ deviation}\ =\ \frac{x - \mu}{\sigma}$$

$$x\ =\ z(\sigma) + \mu$$

$$x\ =\ 2.6(10\%) + 70\%$$

$$x\ =\ 96\%$$

Placement into Math 162 (Math 30-2 Equivalent) Test: Formula Sheet

Factoring

$$a^2 - b^2 = (a-b)(a+b)$$

Quadratic Functions

$$y = ax^2 + bx + c \qquad y = a(x-p)^2 + q \quad \text{or} \quad y = a(x-h)^2 + k \qquad y = a(x-r)(x-s)$$

Quadratic Equations

For $ax^2 + bx + c = 0$: $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Trigonometry

$$c^2 = a^2 + b^2 - 2ab \cos C \qquad\qquad \frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

Geometry

Sum of interior angles of polygon $= 180°(n-2)$

Each interior angle of a regular polygon $= \dfrac{180°(n-2)}{n}$

$$SA_{cylinder} = 2\pi r^2 + 2\pi rh \qquad SA_{cone} = \pi r^2 + \pi rs \qquad SA_{sphere} = 4\pi r^2$$

$$V_{cylinder} = \pi r^2 h \qquad\qquad V_{cone} = \frac{1}{3}\pi r^2 h \qquad\qquad V_{sphere} = \frac{4}{3}\pi r^3$$

$$V_{pyramid} = \frac{1}{3}(A_{Base} \times h) \qquad\qquad V_{prism} = A_{Base} \times h$$

Statistics

$$z = \frac{x - \mu}{\sigma} \qquad\qquad \bar{x} = \frac{\sum x}{n} \qquad\qquad \sigma = \sqrt{\frac{\sum (x - \bar{x})^2}{n}}$$

You will also need a graphing calculator OR a z-score table (standard normal distribution) for the exam.

STANDARD NORMAL DISTRIBUTION: Table Values Represent AREA to the LEFT of the Z score.

Z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
-3.9	.00005	.00005	.00004	.00004	.00004	.00004	.00004	.00004	.00003	.00003
-3.8	.00007	.00007	.00007	.00006	.00006	.00006	.00006	.00005	.00005	.00005
-3.7	.00011	.00010	.00010	.00010	.00009	.00009	.00008	.00008	.00008	.00008
-3.6	.00016	.00015	.00015	.00014	.00014	.00013	.00013	.00012	.00012	.00011
-3.5	.00023	.00022	.00022	.00021	.00020	.00019	.00019	.00018	.00017	.00017
-3.4	.00034	.00032	.00031	.00030	.00029	.00028	.00027	.00026	.00025	.00024
-3.3	.00048	.00047	.00045	.00043	.00042	.00040	.00039	.00038	.00036	.00035
-3.2	.00069	.00066	.00064	.00062	.00060	.00058	.00056	.00054	.00052	.00050
-3.1	.00097	.00094	.00090	.00087	.00084	.00082	.00079	.00076	.00074	.00071
-3.0	.00135	.00131	.00126	.00122	.00118	.00114	.00111	.00107	.00104	.00100
-2.9	.00187	.00181	.00175	.00169	.00164	.00159	.00154	.00149	.00144	.00139
-2.8	.00256	.00248	.00240	.00233	.00226	.00219	.00212	.00205	.00199	.00193
-2.7	.00347	.00336	.00326	.00317	.00307	.00298	.00289	.00280	.00272	.00264
-2.6	.00466	.00453	.00440	.00427	.00415	.00402	.00391	.00379	.00368	.00357
-2.5	.00621	.00604	.00587	.00570	.00554	.00539	.00523	.00508	.00494	.00480
-2.4	.00820	.00798	.00776	.00755	.00734	.00714	.00695	.00676	.00657	.00639
-2.3	.01072	.01044	.01017	.00990	.00964	.00939	.00914	.00889	.00866	.00842
-2.2	.01390	.01355	.01321	.01287	.01255	.01222	.01191	.01160	.01130	.01101
-2.1	.01786	.01743	.01700	.01659	.01618	.01578	.01539	.01500	.01463	.01426
-2.0	.02275	.02222	.02169	.02118	.02068	.02018	.01970	.01923	.01876	.01831
-1.9	.02872	.02807	.02743	.02680	.02619	.02559	.02500	.02442	.02385	.02330
-1.8	.03593	.03515	.03438	.03362	.03288	.03216	.03144	.03074	.03005	.02938
-1.7	.04457	.04363	.04272	.04182	.04093	.04006	.03920	.03836	.03754	.03673
-1.6	.05480	.05370	.05262	.05155	.05050	.04947	.04846	.04746	.04648	.04551
-1.5	.06681	.06552	.06426	.06301	.06178	.06057	.05938	.05821	.05705	.05592
-1.4	.08076	.07927	.07780	.07636	.07493	.07353	.07215	.07078	.06944	.06811
-1.3	.09680	.09510	.09342	.09176	.09012	.08851	.08691	.08534	.08379	.08226
-1.2	.11507	.11314	.11123	.10935	.10749	.10565	.10383	.10204	.10027	.09853
-1.1	.13567	.13350	.13136	.12924	.12714	.12507	.12302	.12100	.11900	.11702
-1.0	.15866	.15625	.15386	.15151	.14917	.14686	.14457	.14231	.14007	.13786
-0.9	.18406	.18141	.17879	.17619	.17361	.17106	.16853	.16602	.16354	.16109
-0.8	.21186	.20897	.20611	.20327	.20045	.19766	.19489	.19215	.18943	.18673
-0.7	.24196	.23885	.23576	.23270	.22965	.22663	.22363	.22065	.21770	.21476
-0.6	.27425	.27093	.26763	.26435	.26109	.25785	.25463	.25143	.24825	.24510
-0.5	.30854	.30503	.30153	.29806	.29460	.29116	.28774	.28434	.28096	.27760
-0.4	.34458	.34090	.33724	.33360	.32997	.32636	.32276	.31918	.31561	.31207
-0.3	.38209	.37828	.37448	.37070	.36693	.36317	.35942	.35569	.35197	.34827
-0.2	.42074	.41683	.41294	.40905	.40517	.40129	.39743	.39358	.38974	.38591
-0.1	.46017	.45620	.45224	.44828	.44433	.44038	.43644	.43251	.42858	.42465
-0.0	.50000	.49601	.49202	.48803	.48405	.48006	.47608	.47210	.46812	.46414

STANDARD NORMAL DISTRIBUTION: Table Values Represent AREA to the LEFT of the Z score.

Z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.50000	.50399	.50798	.51197	.51595	.51994	.52392	.52790	.53188	.53586
0.1	.53983	.54380	.54776	.55172	.55567	.55962	.56356	.56749	.57142	.57535
0.2	.57926	.58317	.58706	.59095	.59483	.59871	.60257	.60642	.61026	.61409
0.3	.61791	.62172	.62552	.62930	.63307	.63683	.64058	.64431	.64803	.65173
0.4	.65542	.65910	.66276	.66640	.67003	.67364	.67724	.68082	.68439	.68793
0.5	.69146	.69497	.69847	.70194	.70540	.70884	.71226	.71566	.71904	.72240
0.6	.72575	.72907	.73237	.73565	.73891	.74215	.74537	.74857	.75175	.75490
0.7	.75804	.76115	.76424	.76730	.77035	.77337	.77637	.77935	.78230	.78524
0.8	.78814	.79103	.79389	.79673	.79955	.80234	.80511	.80785	.81057	.81327
0.9	.81594	.81859	.82121	.82381	.82639	.82894	.83147	.83398	.83646	.83891
1.0	.84134	.84375	.84614	.84849	.85083	.85314	.85543	.85769	.85993	.86214
1.1	.86433	.86650	.86864	.87076	.87286	.87493	.87698	.87900	.88100	.88298
1.2	.88493	.88686	.88877	.89065	.89251	.89435	.89617	.89796	.89973	.90147
1.3	.90320	.90490	.90658	.90824	.90988	.91149	.91309	.91466	.91621	.91774
1.4	.91924	.92073	.92220	.92364	.92507	.92647	.92785	.92922	.93056	.93189
1.5	.93319	.93448	.93574	.93699	.93822	.93943	.94062	.94179	.94295	.94408
1.6	.94520	.94630	.94738	.94845	.94950	.95053	.95154	.95254	.95352	.95449
1.7	.95543	.95637	.95728	.95818	.95907	.95994	.96080	.96164	.96246	.96327
1.8	.96407	.96485	.96562	.96638	.96712	.96784	.96856	.96926	.96995	.97062
1.9	.97128	.97193	.97257	.97320	.97381	.97441	.97500	.97558	.97615	.97670
2.0	.97725	.97778	.97831	.97882	.97932	.97982	.98030	.98077	.98124	.98169
2.1	.98214	.98257	.98300	.98341	.98382	.98422	.98461	.98500	.98537	.98574
2.2	.98610	.98645	.98679	.98713	.98745	.98778	.98809	.98840	.98870	.98899
2.3	.98928	.98956	.98983	.99010	.99036	.99061	.99086	.99111	.99134	.99158
2.4	.99180	.99202	.99224	.99245	.99266	.99286	.99305	.99324	.99343	.99361
2.5	.99379	.99396	.99413	.99430	.99446	.99461	.99477	.99492	.99506	.99520
2.6	.99534	.99547	.99560	.99573	.99585	.99598	.99609	.99621	.99632	.99643
2.7	.99653	.99664	.99674	.99683	.99693	.99702	.99711	.99720	.99728	.99736
2.8	.99744	.99752	.99760	.99767	.99774	.99781	.99788	.99795	.99801	.99807
2.9	.99813	.99819	.99825	.99831	.99836	.99841	.99846	.99851	.99856	.99861
3.0	.99865	.99869	.99874	.99878	.99882	.99886	.99889	.99893	.99896	.99900
3.1	.99903	.99906	.99910	.99913	.99916	.99918	.99921	.99924	.99926	.99929
3.2	.99931	.99934	.99936	.99938	.99940	.99942	.99944	.99946	.99948	.99950
3.3	.99952	.99953	.99955	.99957	.99958	.99960	.99961	.99962	.99964	.99965
3.4	.99966	.99968	.99969	.99970	.99971	.99972	.99973	.99974	.99975	.99976
3.5	.99977	.99978	.99978	.99979	.99980	.99981	.99981	.99982	.99983	.99983
3.6	.99984	.99985	.99985	.99986	.99986	.99987	.99987	.99988	.99988	.99989
3.7	.99989	.99990	.99990	.99990	.99991	.99991	.99992	.99992	.99992	.99992
3.8	.99993	.99993	.99993	.99994	.99994	.99994	.99994	.99995	.99995	.99995
3.9	.99995	.99995	.99996	.99996	.99996	.99996	.99996	.99996	.99997	.99997