Study Guide

For Placement into Grade 12 / Math 30-1 (MATH 182)

Academic Upgrading Placement Test | Version: 9 Jan 2025

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-182 (Math 30-1) 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.

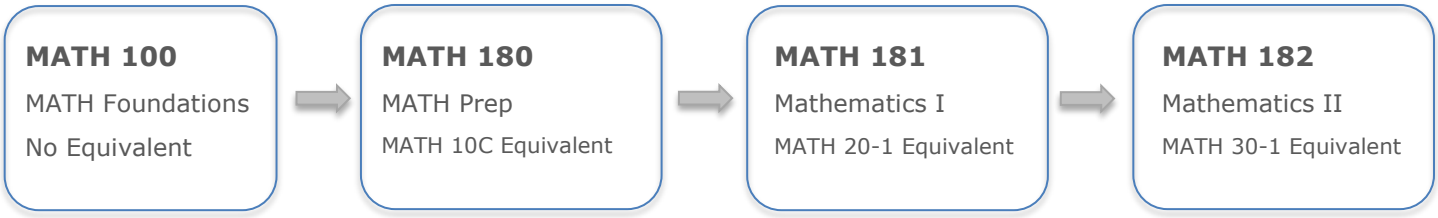
Math Placement Study Guide

This study guide is designed to prepare students for the Academic Upgrading Math Placement test for entry into Math-182 (Math 30-1). Please use the following grade 11 practice exercises to prepare for your online placement test to meet eligibility for Math 30-1. An answer key is included at the end of this guide.

This test is for placement into grade 12 Math 30-1 equivalency (Math 182):

- The test will consist of 15 questions (All multiple choice; no work shown)
- You will be provided with a formula sheet (identical to formula sheet in this guide)
- **A scientific calculator is required. Graphing calculators are NOT permitted**
- 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 182.
- This test is to be written in the Testing Centre.

SAIT Academic Upgrading Course Sequence



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 Material: Mathematic Exercises

The below will be similar to what you will be tested for the placement test into Math 30-1 equivalency (Math 182). Please note that the Sequences & Series unit is NOT on this guide and is NOT on the placement test.

1) Simplify each of the following expressions:

a) $\sqrt{\frac{2}{7}}$

b) $\sqrt{9^2+5^2}$

c) $\sqrt[3]{\frac{16a^4}{27}}$

d) $3cd\sqrt{12a^3b^6c^7}$

2) Perform the following operations and simplify:

a) $\left(3\sqrt{2}-4\sqrt{6}\right)^2$

b) $\frac{4-\sqrt{10}}{\sqrt{72}}$

c) $\frac{\sqrt{3}}{3\sqrt{6}+\sqrt{2}}$

3) Solve the following radical equations (do not include extraneous answers):

a) $\sqrt{x-3}=5$

b) $\sqrt{2x+3} = x$

c) $x = \sqrt{x+4} + 2$

4) Simplify each of the following rational expressions:

a) $\dfrac{a^2+4ab+4b^2}{a+2b}$

b) $\dfrac{x^4-1}{x-1}$

c) $\dfrac{\dfrac{n^2-9}{n}}{\dfrac{1}{n}-\dfrac{1}{3}}$

d) $\dfrac{2}{a+2}-\dfrac{3-a}{a^2+2a}+\dfrac{1}{a}$

e) $\dfrac{4x^2-36}{x^3-25x}\times\dfrac{7x-35}{3x^2+9x}$

5) Solve each of the following rational equations (do not include any extraneous answers):

a) $\dfrac{x}{2x-3}=4$

b) $\dfrac{3}{x+3}-\dfrac{1}{x}=\dfrac{5}{6+2x}$

c) $\dfrac{2}{x^2-1}-\dfrac{2}{x+1}=\dfrac{1}{x-1}$

d) $\dfrac{2}{2x^2+5x-3}+\dfrac{3}{2x+6}=\dfrac{1}{4x-2}$

6) Determine the exact value of each of the following:

a) cos 315°
b) tan 135°
c) sin 150°
d) cos 120°
e) sin 180°
f) cos 90°
g) cos 180°
h) tan 270°

7) Determine the exact values of sin θ, cos θ, and tan θ in simplest form, given that the terminal arm of the angle θ goes through the point (-6, 4).

8) Solve for all angles of θ, $0^o \le \theta \le 360^o$, for each of the following:

a) $\tan\theta = \sqrt{3}$

b) $\cos\theta = \dfrac{-\sqrt{3}}{2}$

c) $\sin\theta = \dfrac{-\sqrt{2}}{2}$

d) $\sin\theta = -1$

e) $\cos\theta = 0$

f) $\tan\theta$ = undefined

9) For the function $f(x) = x^2 + x - 12$:

a) Draw the function. Clearly show x-intercepts, the y-intercept, and the vertex, and state the domain and range of the function.

b) Draw the graph of $y = |f(x)|$. Clearly show x-intercepts, the y-intercept, and the vertex, and state the domain and range of the function.

10) Order the following numbers from largest to smallest. $\left|-2\frac{1}{8}\right|,\ -\left|-2\frac{1}{4}\right|,\ -|2.5|,\ \left|-2\frac{1}{4}\right|$

11) For the function $f(x) = \frac{1}{2}|x-2| - 4$:

a.) Draw the graph of the function. Clearly show x-intercepts, the y-intercept, and the vertex, and state the domain and range of the function.

b.) Write the equation of the function in piecewise notation.

12) Rearrange the quadratic equation $y = 4x^2 + 2x + 1$ to the form $y = a(x-p)^2 + q$ by completing the square.

13) Solve the following quadratic equation: $2x^2 + 8x - 3 = 0$

14) Solve the following system of equations algebraically:

$y = x + 7$

$y = x^2 - 49$

15) Solve the following inequalities:

a) $\frac{2}{3}(2-x) > \frac{1}{2} + x$

b) $x^2 - 16 < 6x$

c) Draw the graph of the solution to the following, including shading and correct solid vs. dashed line: $y > 3x - 2$

16) For the following oblique triangles, note that the placement test is no-calculator, so you may be asked to identify which formula (sine or cosine law) you would use, how you would manipulate the formula, and how to substitute numbers up to, but not including, any step that would require a calculator. (The answer key to this guide will show the last step before a calculator would be used, but will also show the final answer from a calculator so you can check your final work.)

a) If a = 6.2 cm, A = 65.0º, and B = 55.2º, solve for side c to the nearest tenth.

b) If a = 21.61 cm, b = 29.33 cm, and c = 42.57 cm, solve for the smallest angle in the triangle to the nearest tenth.

Grade 11 Material: Answer Key

For placement into Math 30-1 equivalency (Math 182)

All graphs in this answer key were created with desmos.com.

1) a) $\frac{\sqrt{14}}{7}$ b) $\sqrt{106}$ c) $\frac{2a\sqrt[3]{2a}}{3}$ d) $6ab^3c^4d\sqrt{3ac}$

2) a) $114-48\sqrt{3}$ b) $\frac{2\sqrt{2}-\sqrt{5}}{6}$ c) $\frac{9\sqrt{2}-\sqrt{6}}{52}$

3) a) x = 28 b) x = 3 c) x = 5

4) a) $a+2b$ b) $(x+1)(x^2+1)$ c) -3(n+3) or can write as -3n – 9

d) $\frac{4a-1}{a(a+2)}$ e) $\frac{28(x-3)}{3x^2(x+5)}$

5) a) $x=\frac{12}{7}$ b) $x=-6$ c) no solution d) x = 2/5

6) a) $\frac{\sqrt{2}}{2}$ b) -1 c.) $\frac{1}{2}$ d.) $\frac{-1}{2}$ e.) 0 f.) 0 g.) -1 h.) undefined

7) $\sin\theta=\frac{2\sqrt{13}}{13}$ $\cos\theta=\frac{-3\sqrt{13}}{13}$ and $\tan\theta=\frac{-2}{3}$

8) 60º, 240º b.) 150º, 210º c.) 225º, 315º d.) 270º e.) 90º, 270º f.) 90º, 270º

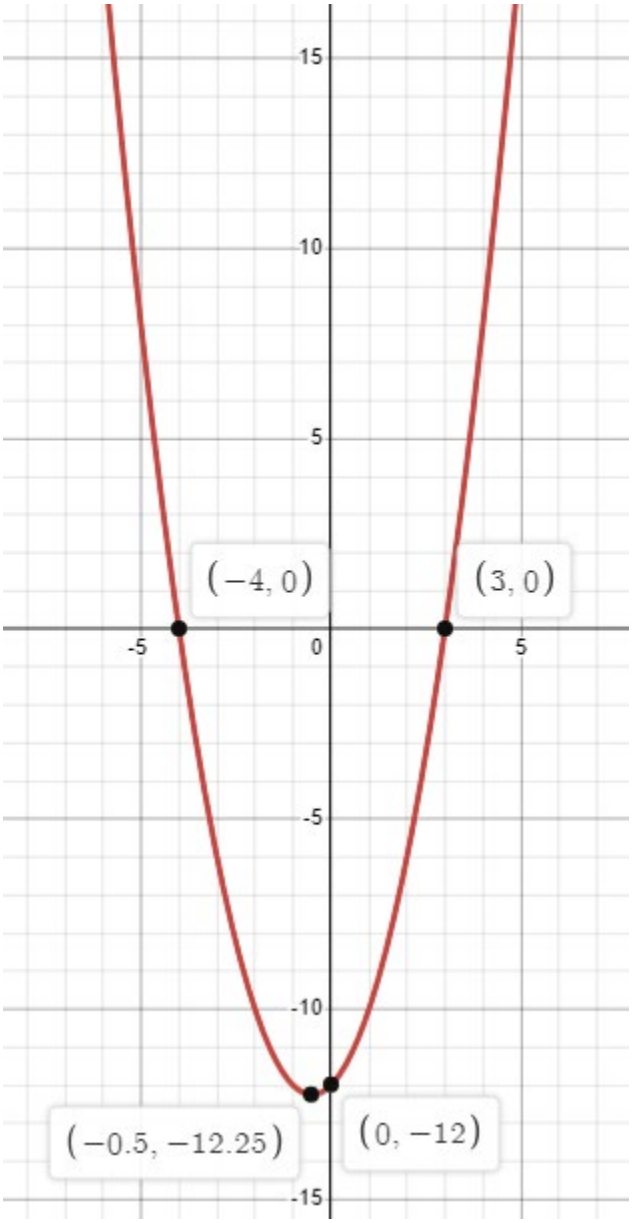
9) a.) $f(x) = x^2 + x - 12$:

x-int.: (-4,0), (3,0); y-int. = (0,-12)

vertex: (-1/2, -49/4) (note: -49/4 = -12.25)

domain: $x \in \mathbb{R}$

range: $y \geq -49/4$



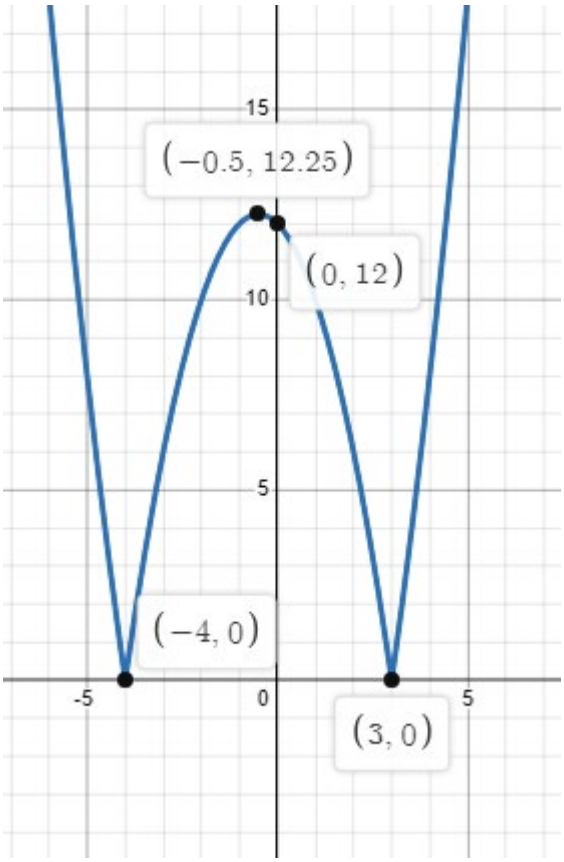
b.) $y = |f(x)| = |x^2 + x - 12|$

x-int.: (-4,0), (3,0); y-int. = (0,12)

vertex: (-1/2, 49/4) (note: 49/4 = 12.25)

domain: $x \in \mathbb{R}$

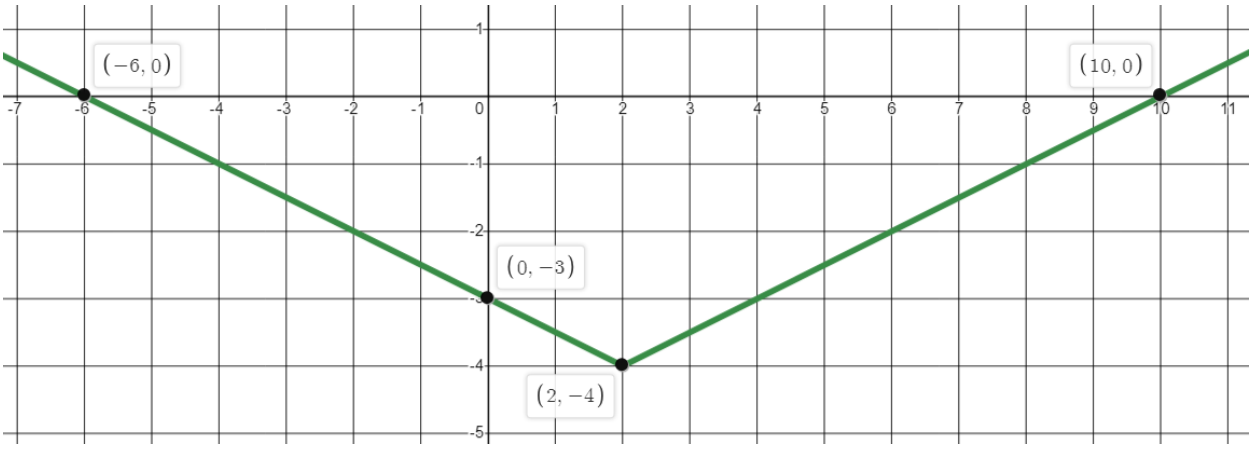
range: $y \geq 0$



10) $\left|-2\frac{1}{4}\right|, \left|-2\frac{1}{8}\right|, -\left|-2\frac{1}{4}\right|, -|2.5|$

11) $f(x)=\frac{1}{2}|x-2|-4$

a.) x-int: (-6,0), (10,0); y-int: (0, -3); vertex: (2, -4); domain: $x \in \mathbb{R}$; range: $y \geq -4$



b.) piecewise notation:

$$y=\begin{cases} -\frac{1}{2}x-3, x\leq 2 \\ \frac{1}{2}x-5, x\geq 2 \end{cases}$$

12) $y=4\left(x+\frac{1}{4}\right)^2+\frac{3}{4}$

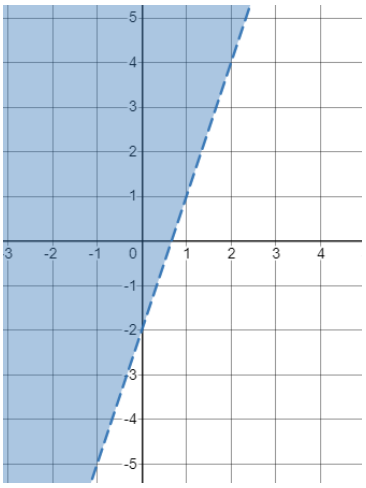
13) $x=\frac{-4\pm\sqrt{22}}{2}$

14) (8,15) and (-7,0)

15) a) $x < \frac{1}{2}$

b) $-2 < x < 8$

c)



16) a) Last step expected for placement test (no calculator):

$$c = \frac{6.2 \sin 59.8^o}{\sin 65.0^o}$$

Final step if using a calculator: c = 5.9 cm

b) Last step expected for placement test (no calculator):

$$\cos A = \frac{21.61^2 - 29.33^2 - 42.57^2}{-2(29.33)(42.57)}$$ (and then take $\cos^{-1}$ of that value)

Final step if using a calculator: A = 28.0°

Grade 11 Material: Formula Sheet

For placement into Math 30-1 equivalency (Math 182)

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

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$c^2 = a^2 + b^2 - 2ab\cos C$$