



Study Guide

For Placement into Grade 11 / Math 20-1 (MATH 181)



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-181 (Math 20-1) 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

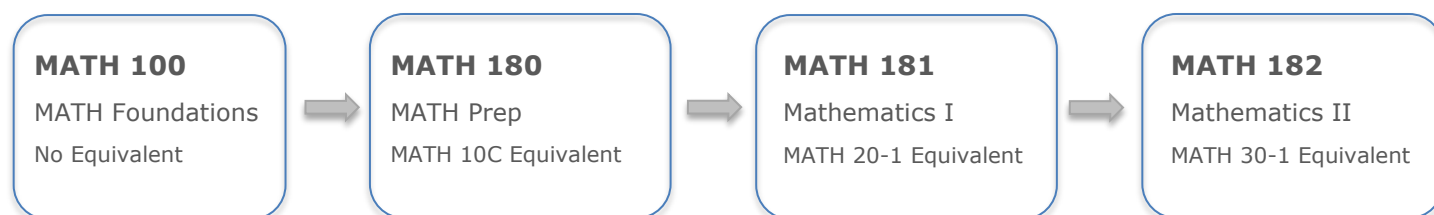
This study guide is designed to prepare students for the Academic Upgrading Math Placement test for entry into Math-181 (Math 20-1). Please use the following grade 10 practice exercises to prepare for your online placement test to meet eligibility for Math 20-1. An answer key is included at the end of this guide.

This test is for placement into grade Math 20-1 equivalency (Math 181):

- The study guide consists of 33 questions for practice. The actual test will consist of 16 questions.
- **No calculators are permitted for this test.**
- 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-181.
- 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 10 Material: Mathematic Exercises

The below will be similar to what you will be tested for placement into Math 20-1 equivalency (Math 181). All questions are to be completed without a calculator.

- 1) Add the following numbers: $2\frac{3}{5} + 1\frac{5}{6}$.
- 2) Perform the following subtraction: $\frac{7}{3} - \frac{13}{14}$.
- 3) Multiply the following numbers: $-\frac{9}{14} \times \frac{28}{27}$. Express your answer in reduced form.
- 4) Perform the following division: $-\frac{6}{15} \div \left(-\frac{16}{25}\right)$. Express your answer in reduced form.
- 5) Which set of numbers represents the prime factorization of 192?
- 6) Determine the square root of 441.
- 7) Estimate the square root of 45 to the nearest tenth.
- 8) Simplify the following radical expression into a mixed radical by leaving the smallest possible integer under the radical: $\sqrt{396}$
- 9) Convert the following mixed radical product into a single simplified radical expression:
 $5\sqrt{3} \times 3\sqrt{6}$
- 10) Simplify the following exponent expression: $(3a^2)(5a^3)$

11) Simplify the following exponent expression: $-2y^{-3} (3y^3)^4$

12) Simplify the following exponent expression: $(4x^3)3x^{-2}$

13) Simplify the following exponent expression: $\left(\frac{3}{5}\right)^{-3}$

14) Perform the following multiplication: $(3x - 4)^2$

15) Factor the following expression: $x^3 - 1$

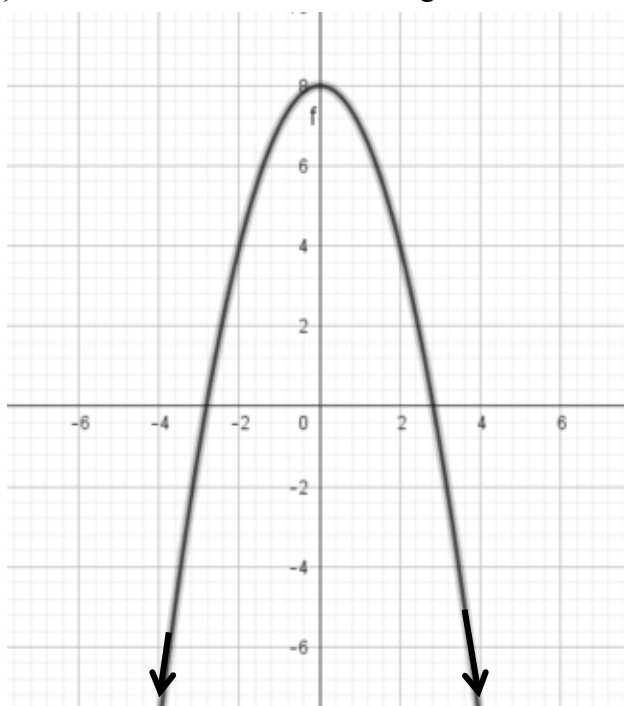
16) Factor the following expression: $24x^6 + 18x^5 - 3x^4$

17) Factor the following expression: $9x^2 - 16y^2$

18) Factor the following expression: $x^2 - 9x - 36$

19) Factor the following expression: $6x^2 - 19x + 15$

20) Determine the domain and range of the following graph.

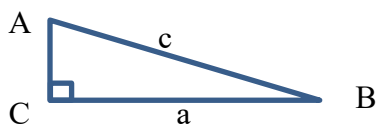


- 21) Explain why the following set of ordered pairs could not be part of a function:
 $(-3, 2), (2, -1), (-3, 5), (\frac{1}{2}, \frac{1}{4})$
- 22) Determine the slope of a line segment with end points $(3, 1)$ and $(6, -11)$.
- 23) A line with slope $\frac{1}{4}$ passes through $(-2, -4)$. Determine the y -value of a point where $x = -1$.
- 24) Determine if the following equations represent lines that are parallel to each other, perpendicular to each other, or neither.
 $2x - 3y = 1$ and $2y + 3x = 2$
- 25) Given that $f(x) = -2x^2 + 3x - 1$, determine $f(-\frac{1}{3})$.

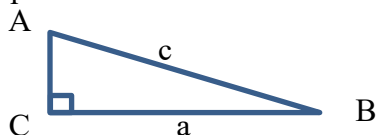
- 26) Determine the ordered pair solution to following system of equations:

$$3x - 2y = 1 \text{ and } x + 2y = 2$$

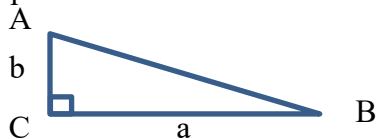
- 27) Write the expression to determine the value of angle A if $c=15\text{cm}$ and $a=10\text{cm}$.



- 28) Write the expression to determine the value of side c if $a=50\text{cm}$ and $B=38^\circ$.

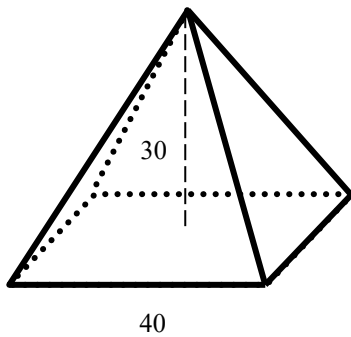


- 29) Write the expression to determine the value of side b if $a=50\text{cm}$ and $B=38^\circ$.

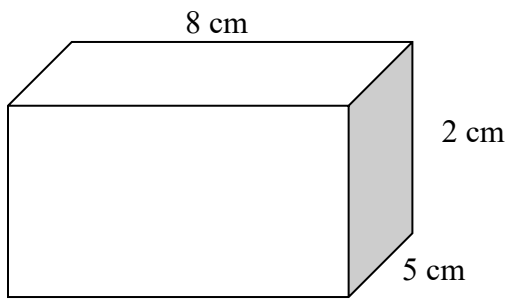


- 30) Write the expression to convert 191 lb (pounds) to kg (kilograms) to 3 significant figures. $1 \text{ kg} = 2.205 \text{ lb}$.

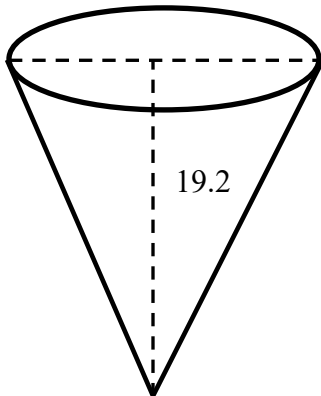
- 31) Determine the volume of the following pyramid with a square base of 40.0 cm on each side and an overall height of 30.0 cm.



- 32) Determine the volume and total surface area of the following closed box:



- 33) Given that the volume and height of a right circular cone are, respectively, 519 cm^3 and 19.2 cm, determine the expression for the diameter of the top.



Grade 10 Material: Answer Key

For placement into Math 20-1 equivalency (Math 181)

- 1) $4\frac{13}{30}$ 2) $\frac{59}{42}$ 3) $-\frac{2}{3}$ 4) $\frac{5}{8}$
- 5) $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3$
- 6) 21
- 7) 6.7
- 8) $6\sqrt{11}$
- 9) $45\sqrt{2}$
- 10) $15a^5$
- 11) $-162y^9$
- 12) $12x$
- 13) $\frac{125}{27}$
- 14) $9x^2 - 24x + 16$
- 15) $(x - 1)(x^2 + x + 1)$
- 16) $3x^4(8x^2 + 6x - 1)$
- 17) $(3x + 4y)(3x - 4y)$
- 18) $(x - 12)(x + 3)$
- 19) $(2x - 3)(3x - 5)$
- 20) Domain: $x \in R$; Range: $y \in R, y \leq 8$
- 21) The 2 points $(-3, 2)$ and $(-3, 5)$ have the same x value. In a function, a specific value of x can only map to a single value of y .
- 22) $-\frac{4}{1}$ or -4
- 23) $y = -\frac{15}{4}$
- 24) The slopes are negative reciprocals indicating perpendicular lines.
- 25) $-2\frac{2}{9}$ or $-\frac{20}{9}$

26) $\left(\frac{3}{4}, \frac{5}{8}\right)$

27) $A = \arcsin\left(\frac{10}{15}\right)$

28) $c = \frac{50\text{cm}}{\cos 38^\circ}$

29) $(50\text{cm}) \tan 38^\circ = b$

30) $191\text{lb} \times \frac{1\text{kg}}{2.205\text{lb}}$ (note: result is 86.6 kg)

31) 16000 cm^3

32) $SA = 132 \text{ cm}^2$; $V = 80 \text{ cm}^3$

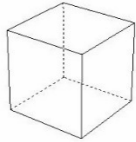
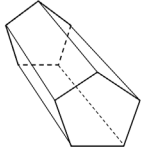
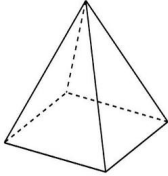
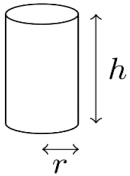
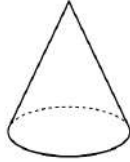
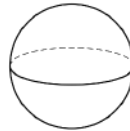
33) $2\sqrt[3]{\frac{3(519\text{cm}^3)}{\pi}} = d$ (Note: result would be 10.2 cm)

MATH 180 Formula Sheet

Metric and Imperial Conversions

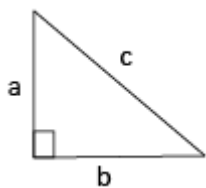
Relationships between Imperial Units	Approximate Relationships between Imperial Units and Metric Units	Relationships between Metric Units
1 mile = 1760 yards 1 mile = 5280 feet	1 mile = 1.609 km 1 km = 0.6214 miles	1 km = 1000 m
1 yard = 3 feet 1 yard = 36 inches	1 yard = 0.9144 m 1 m = 1.094 yd	1 m = 100 cm
1 foot = 12 inches	1 foot = 0.3048 m = 30.48 cm 1 m = 3.281 ft	1 cm = 10 mm
	1 inch = 2.54 cm 1 cm = 0.3937 in	

Area, Surface Area and Volume for standard shapes

Shape	Shape	Volume	Surface Area
	Rectangular prism	$V = lwh$	$SA = 2(lw + lh + wh)$ or $SA = 2lw + 2lh + 2wh$
	Right prism of any base	$V = Bh; B = \text{area of base}$	$SA = ph + 2B; p = \text{perimeter of base}$
	Right pyramid	$V = \frac{1}{3}lwh$	$SA = \frac{1}{2}(\text{slant hgt})(\text{perimeter of base}) + (\text{area of base})$
	Cylinder	$V = \pi r^2 h$	$SA = 2\pi r h + 2\pi r^2$
	Cone	$V = \frac{1}{3}\pi r^2 h$	$SA = \pi r s + \pi r^2$
	Sphere	$V = \frac{4}{3}\pi r^3$ or $V = \frac{1}{6}\pi d^3$	$SA = 4\pi r^2$ or $SA = \pi d^2$

Area: Rectangle $A = lw$ Triangle $A = \frac{1}{2}bh$ Circle $A = \pi r^2$

Pythagorean Theorem



$$c^2 = a^2 + b^2$$

Trigonometric Ratios

$$\sin A = \frac{\textit{opposite}}{\textit{hypotenuse}} \quad \cos A = \frac{\textit{adjacent}}{\textit{hypotenuse}} \quad \tan A = \frac{\textit{opposite}}{\textit{adjacent}}$$

Exponent Laws

Exponent Law	Rule
Product of Powers	$x^m \times x^n = x^{m+n}$
Quotient of Powers	$\frac{x^m}{x^n} = x^{m-n}$
Power of a Power	$(x^m)^n = x^{m \times n}$
Power of a Product	$(xy)^m = x^m y^m$
Power of a Quotient	$\left(\frac{x}{y}\right)^m = \frac{x^m}{y^m}$
Zero Exponent	$x^0 = 1$
Negative Exponent	$x^{-m} = \frac{1}{x^m}$
Fractional Exponent	$\frac{m}{x^n} = \sqrt[n]{x^m} \text{ or } (\sqrt[n]{x})^m$

Linear Functions

$$\textit{slope} = \frac{\textit{rise}}{\textit{run}} \quad m = \frac{y_2 - y_1}{x_2 - x_1} \quad \textit{slope} = \frac{\Delta y}{\Delta x}$$

slope-intercept form $y = mx + b$

general form $Ax + By + C = 0$ slope-point form $(y - y_1) = m(x - x_1)$

standard form $Ax + By = C$