# Academic Upgrading

**Academic Services**

# **Study Guide for Placement** into Grade 11 (Math 20-1/Math 181) Math

Updated: June 2023

# Important Information

## The Math Placement Test

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 tests.

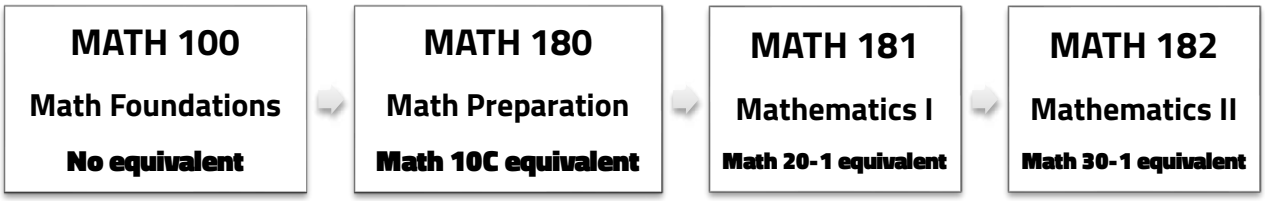
## Math Placement Study Guide

This study guide is designed to prepare students for the Academic Upgrading Math Placement test for Math 20-1 (Math 181). 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 11 Math 20-1 equivalency (Math 181):

- This test (18 questions) is to be attempted
- The test is to be completed in 60 minutes.
- A passing mark of 60% or greater is required in this test for eligibility to register for Math 181
- This test is to be written in the Testing Centre.
- Instructions for each test are also provided at the start of the test.

## 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 172** (Applied Math 30 equivalent) and **MATH 162** (Mathematics 30-2 equivalent) as evening courses only, although they are not represented in the course sequence above. These two courses are 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). Talk to an upgrading advisor for more information on the tests required for those courses as it is different than for Math 182.

**Please review your future program's math admission requirements on www.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 Mathematics content – Practice Exercises (Non-calculator portion)

## These will be similar to what you will be tested on in the placement test into Grade 11 (Math 20-1/ Math 181) math.

## (All are to be completed without using 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: $x^3 - 1$

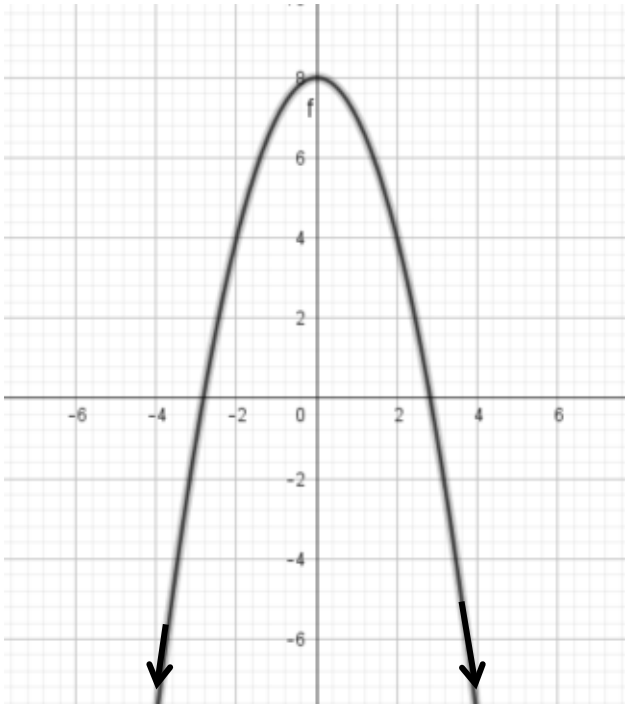
**16)** Factor the following expression: $24x^6 + 18x^5 - 3x^4$

**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), ( ½ , ¼ )

**22)** Determine the slope of a line segment with end points (3, 1) and (6, -11).

**23)** A line with slope ¼ 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.

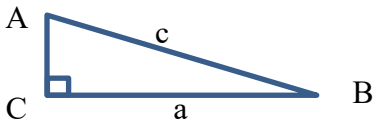
$2x - 3y = 1$ and $2y + 3x = 2$

**25)** Given that $f(x) = -2x^2 + 3x - 1$, determine $f(-1/3)$.

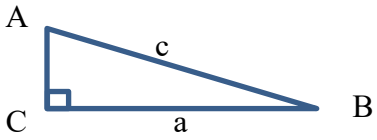
**26)** Determine the ordered pair solution to following system of equations:

$3x - 2y = 1$ and $x + 2y = 2$

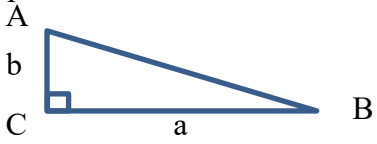
**27)** Write the expression to determine the value of angle A if c=15cm and a=10cm.




**28)** Write the expression to determine the value of side c if a=50cm and B=38°.

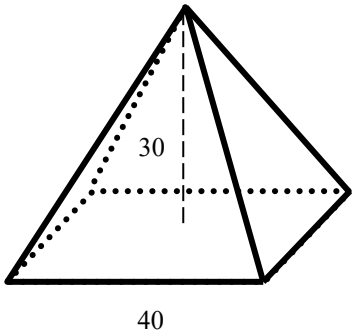



**29)** Write the expression to determine the value of side b if a=50cm and B=38°.

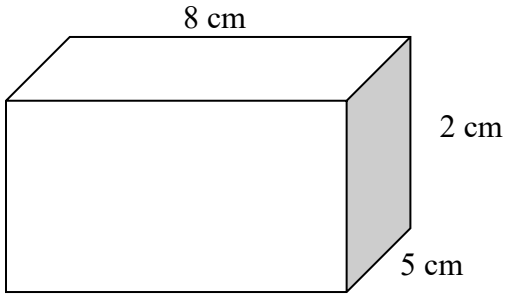



**30)** Write the expression to convert 191 lb (pounds) to kg (kilograms) to 3 significant figures. 1 kg = 2.205 lb.

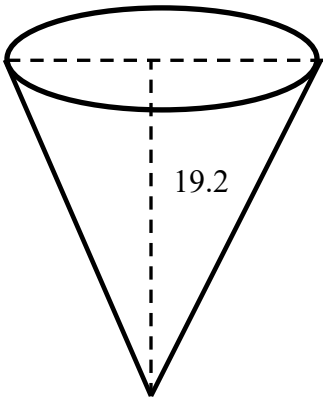
**31)** Determine the volume of the following pyramid with a square base of 40.0 cm on each side and an overall height of 30.0 cm.




**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 Mathematics content – for placement into grade 11

# (Math 20-1/Math-180)

## Answer Key

**1)** $4\frac{13}{30}$ **2)** $\frac{59}{42}$ **3)** $-\frac{2}{3}$ **4)** $\frac{5}{8}$

**5)** 2 x 2 x 2 x 2 x 2 x 2 x 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)** $c = \frac{50cm}{\cos 38^o}$

**29)** $(50cm)\tan 38^o = b$

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

**31)** 16000 $cm^3$

**32)** SA = 132 $cm^2$; V = 80 $cm^3$

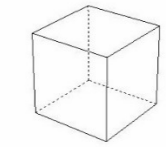
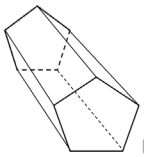
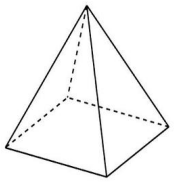
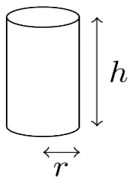
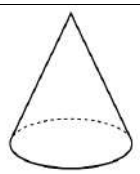
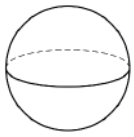
**33)** $2\sqrt[3]{\frac{3\left(519cm^3\right)}{\pi}} = d$ (Note: result would be10.2 cm)

# MATH 180 Formula Sheet

## Metric and Imperial Conversions

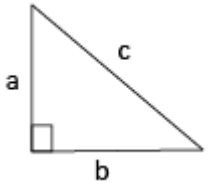
| Relationships between Imperial Units | Approximate Relationships between Imperial Units and Metric Units | Relationships between Metric Units |
|---|---|---|
| 1 mile = 1760 yards<br>1 mile = 5280 feet | 1 mile = 1.609 km<br>1 km = 0.6214 miles | 1 km = 1000 m |
| 1 yard = 3 feet<br>1 yard = 36 inches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

## Area, Surface Area and Volume for standard shapes

| Shape | Shape | Volume | Surface Area |
|---|---|---|---|
|  | Rectangular prism | $V = lwh$ | $SA = 2(lw + lh + wh)$<br>or $SA = 2lw + 2lh + 2wh$ |
|  | Right prism of any base | $V = Bh; B = area\ of\ base$ | $SA = ph + 2B; p = perimeter\ of\ base$ |
|  | Right pyramid | $V = \frac{1}{3}lwh$ | $SA = \frac{1}{2}(slant\ hgt)(perimeter\ of\ base) + (area\ of\ base)$ |
|  | Cylinder | $V = \pi r^2 h$ | $SA = 2\pi rh + 2\pi r^2$ |
|  | Cone | $V = \frac{1}{3}\pi r^2 h$ | $SA = \pi rs + \pi r^2$ |
|  | 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**

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

**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 | $x^{\frac{m}{n}} = \sqrt[n]{x^m}$ *or* $\left(\sqrt[n]{x}\right)^m$ |

**Linear Functions**

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

slope-intercept form $y = mx + b$

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

standard form $Ax + By = C$