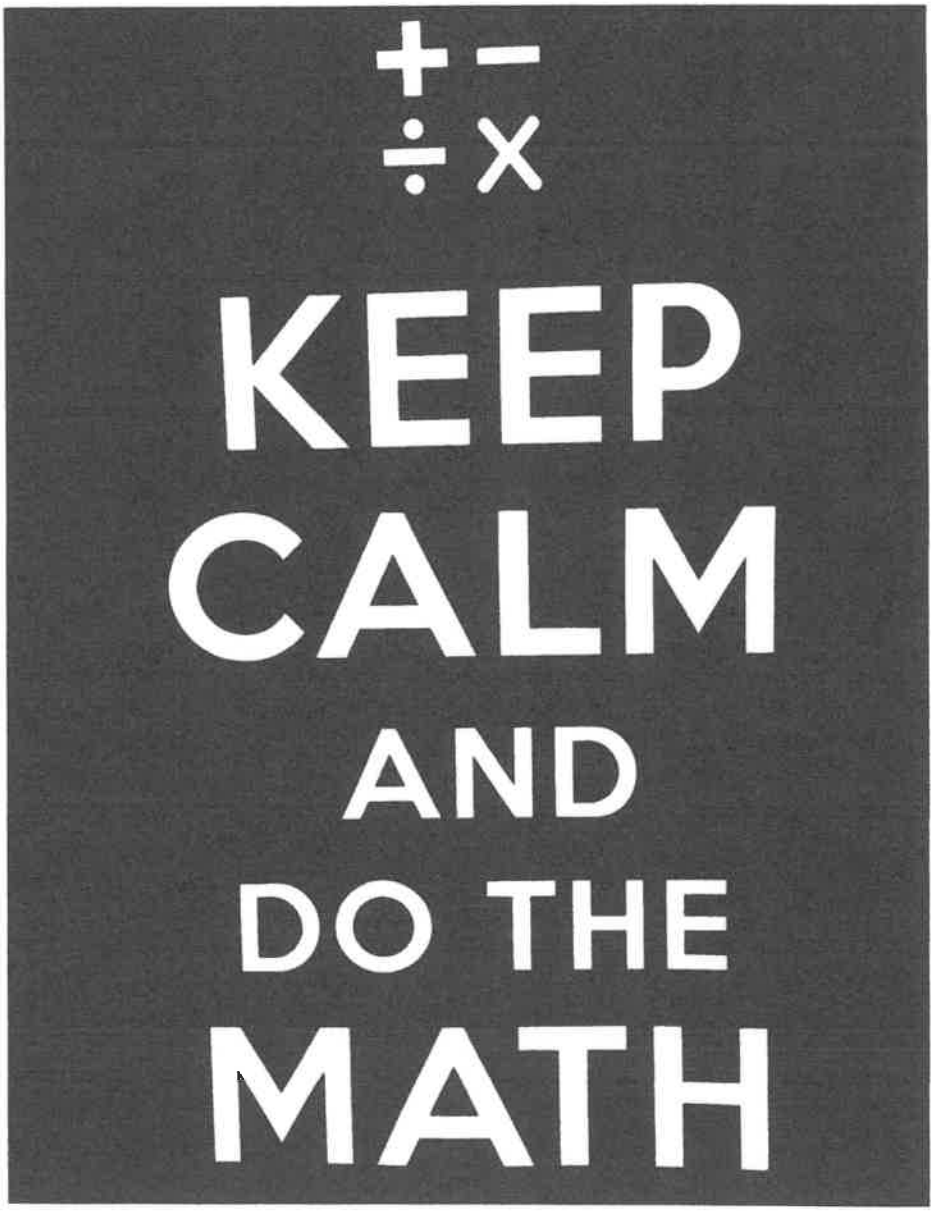
NOMBRE: _____

P.A.T Prep

Released Non-Calculator Questions

2017-2018

(Questions from the 2018 Exam)



St. Brendan School

Mr. Martínez

General Description of the Mathematics 2019 P.A.T

General Description

The Grade 9 Mathematics Provincial Achievement Test consists of two parts:

- Part A contains 20 numerical-response questions and assesses students' foundational skills and fluency in mental math, estimation, algebra, square roots, exponent laws, and arithmetic operations on rational numbers without the use of calculators.
- Part B contains 32 multiple-choice questions and 8 numerical-response questions and assesses students' ability to recall concepts and principles and to apply reasoning skills to solve problems.

Questions are categorized according to three levels of complexity: low, moderate, and high. (See Appendix 1 for a more detailed explanation of each complexity level.)

Question Format

The following bullets briefly describe the two question formats:

- Multiple-choice questions provide students with four response options, of which only one is correct.
- Numerical-response questions require students to generate a response (in symbolic form) to a particular problem, rather than selecting a response from a list of four options.

General Strategies Non-calculator Question

FRACTIONS and DECIMALS

- Because it makes it easier, I suggest that when dealing with fractions you ***convert them all to fractions of equal denominators.***
- It is helpful to have a denominator of 100 whenever possible. That is, if you can, multiply the fraction by a number to get a denominator of 100 (do not forget that you MUST multiply both numerator and denominator).
- When dealing with decimals:
  - Try using a benchmark. For example, 0.80 is 0.20 away from 1.
  - I find it truly helpful to convert decimals into fractions:

- ***WORK OUT THE SIGNS FIRST!***
- ***When adding and subtracting decimals, make sure you lineup the decimal point.***
- **To add decimals**, break it up so you add in pieces of a more manageable unit. This means adding or subtracting to get to numbers that are easier to deal with:

3.27 + 6.19

Add 0.3 *to get to* 3.30 *Add* 0.1 *to get to* 6.20

3.30 + 6.20 = 9.50

Now subtract what you added:

9.50 − 0.4 = 9.10

- **When multiplying decimals,** remember that your answer ***MUST HAVE a number of decimal places EQUAL TO THE TOTAL AMOUNT OF DECIMAL PLACES of all the numbers being multiplied.***
- **When dividing decimals, "group and count":**

4 ÷ 0.25

Each "1" has 4 of the 0.25 groups

1 2 3 4

4 "0.25" 4 "0.25" 4 "0.25" 4 "0.25"

Total = 16

MULTIPLICATION AND DIVISION

- Remember that multiplication and division are inversely related:

$3 \times 2 = 6$ *so* $6 \div 2 = 3$ *and* $6 \div 3 = 2$

- **DO THE SIGNS FIRST:**

$(-)\times(-) = (+)$ $(-) \div (-) = (+)$

$(+)\times(+) = (+)$ $(+) \div (+) = (+)$

$(-)\times(+) = (-)$ $(-) \div (+) = (-)$

- An **ODD amount of multipliers or divisors result in NEGATIVE** numbers.
- An **EVEN amount of multipliers or divisors result in POSITIVE** numbers.

DISTRIBUTIVE PROPERTY

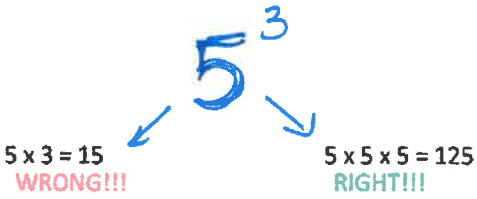
- The number outside the bracket multiplies EVERY term inside the bracket. ***ALWAYS DISTRIBUTE FIRST! (You can't separate the outside number from its bracket. Distribute first and then continue following BEDMAS).***

SOLVING EQUATIONS

- Move EVERYTHING at once ("the river method"):
  - Choose the side for the variable that automatically makes it positive (it' easier).
  - Move ALL the variables to that side.
  - Move ALL numbers to the other side.

- REMEMBER THAT ANYTHING THAT GOES ACROSS THE "=" SIGN CHANGES TO ITS INVERSE: Adding to subtracting and vice versa; Multiplication to division and vice versa.
- Work everything out so that you end up with a positive variable with a coefficient of 1.

POWERS



- Pair **LIKE-BASES only!**
- A base is ***NEGATIVE only when the negative sign is INSIDE the bracket.***
- When the base is negative:
  - ***Negative base with EVEN exponent: +***
  - ***Negative base with ODD exponent: -***

$$(-9)^2 = (-9) \times (-9) = 81$$

$$(-9)^3 = (-9) \times (-9) \times (-9) = -729$$

- The "laws" you learned ***ONLY APPLY TO THE MULTIPLICATION AND DIVISION of EXPONENTS WITH EQUAL BASES:***
  - When ***multiplying*** POWERS OF EQUAL BASE -------→ **ADD** the exponents
  - When ***dividing*** POWERS OF EQUAL BASE ------→ ***SUBTRACT*** the exponents.

A. $6^6 \bullet 6^3$

6^{6+3} *Add exponents.*

6^9

B. $n^5 \bullet n^7$

n^{5+7} *Add exponents.*

n^{12}

they do not apply to the ADDITION and SUBTRACTION of POWER

$$\frac{2^6}{2^2} = 2^{6-2} = 2^4$$

- ***When ADDING or SUBTRACTING any powers, YOU MUST USE THEIR STANDARD FORM instead.*** That is, their ***NUMERICAL VALUE:***

$$3^2 + 3^3 = 3x3 + (3x3x3) = 9 + 27 = 36$$

- If the exponent = 0, then your answer is ALWAYS 1.

$4^0 = 1$ $(-3)^0 = 1$ $100^0 = 1$

$1{,}000{,}000^0 = 1$ $(-\frac{1}{2})^0 = 1$

- If nothing is showing (exponent-wise), it means the exponent is 1!

4 is the same as $(4)^1$

- Anytime you have **(base$^{\text{exponent}}$)$^{\text{exponent}}$**, you **MULTIPLY the exponents!**

$$(a^m)^n = a^{mn}$$

$$(3^2)^3 = 3^{2\cdot3} = 3^6$$

$$(x^2)^4 = x^{2\cdot4}$$

- **Exponents are ALSO DISTRIBUTED:**

$$(4yz)^3 = 4^3 \cdot y^3 \cdot z^3 = 64y^3z^3$$

PERFECT SQUARES and SQUARE ROOTS

- Make sure you know these perfect squares and square roots:

$1^2 = 1$	$11^2 = 121$
$2^2 = 4$	$12^2 = 144$
$3^2 = 9$	$13^2 = 169$
$4^2 = 16$	$14^2 = 196$
$5^2 = 25$	$15^2 = 225$
$6^2 = 36$	$16^2 = 256$
$7^2 = 49$	$17^2 = 289$
$8^2 = 64$	$18^2 = 324$
$9^2 = 81$	$19^2 = 361$
$10^2 = 100$	$20^2 = 400$
$1^3 = 1$	$2^3 = 8$
$3^3 = 27$	$4^3 = 64$

Square Roots

$\sqrt{1} = 1$	$\sqrt{36} = 6$	$\sqrt{121} = 11$
$\sqrt{4} = 2$	$\sqrt{49} = 7$	$\sqrt{144} = 12$
$\sqrt{9} = 3$	$\sqrt{64} = 8$	$\sqrt{169} = 13$
$\sqrt{16} = 4$	$\sqrt{81} = 9$	$\sqrt{196} = 14$
$\sqrt{25} = 5$	$\sqrt{100} = 10$	$\sqrt{225} = 15$

- Practice approximating square roots. ***When asked to approximate, and due to the ambiguity of it, I'm pretty convinced you'll be asked to approximate only to a nearest benchmark (integer, whole or given number).***
- ***PERFECT SQUARES with zeroes MUST HAVE AN EVEN AMOUNT OF ZEROES TO BE PERFECT SQUARES:***

If a number ends with odd number of zeros then it is not a perfect square.

Example:	1) 30	= Not perfect square
	2) 5000	= Not perfect square
	3) 400000	= Not perfect square
	4) 100	= Perfect square
	5) 60000	= Perfect square

This method for finding square roots will work if the number is a multiple of 100, that is, it has an even number of zeroes, and starts with a perfect square.

Ex:

$\sqrt{2500}$

- It has an even number of zeroes
- 25 is a perfect square

$\sqrt{2500} = \sqrt{25} \times \sqrt{100}$ (half the zeroes)

$= 5 \times 10 = 50$

$\sqrt{1\,440\,000}$

- 144 is a perfect square
- there are 4 zeroes

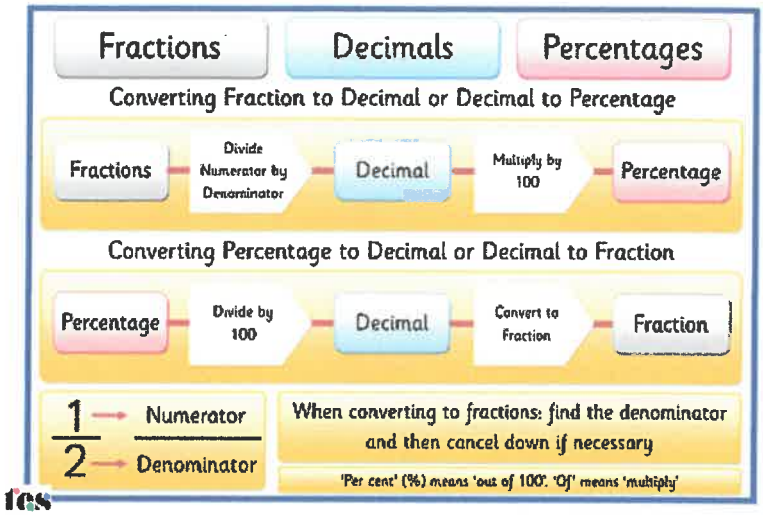
$\Rightarrow \sqrt{144 \times 10000} = \sqrt{144} \times \sqrt{10000}$ (half zeroes)

$= 12 \times 100$

$= 1200$

Example 1:

PERCENTAGES



- ***To get 10%:***
  Bring a decimal dot one place in: 10% of 45 is 4.5.
- **50% is HALF** the amount.
- 20% = 10% + 10%
  30% = 10% + 10% + 10%
  40% = 50% - 10% or 10%+10%+10%+10%
- ***To convert a percentage to decimal, DIVIDE by 100.***

20 % = 20 . = .20 = .2 = 0.2 ✓

2 % = 2 . = . _2 = . 02 = 0.02 ✓

222 % = 222 . = 2.22 ✓

0.02 % = 0.02 = . _002 = .0002 = 0.0002 ✓

- ***To convert a decimal to a percentage, MULTIPLY by 100.***

0.2 = 0.2_ = 020. = 020 = 20 = 20 % ✓

0.02 = 0.02 = 002. = 002 (Remove Leading O's) = 2 % ✓

2.22 = 2.22 = 222. = (Remove Decimal Point) = 222 % ✓

0.0002 = 0.0002 = 000.02 = 0.02 = 0.02 % ✓

- ***To get the % of any number, multiply such number by the decimal form of the percentage:***

30% of what is 60?

$0.3 \times \_\_\_\_ = 60$

$60/0.3 = 200$

NOTE: Assessment Highlights are Actual Exam Questions

P.A.T. Assessment Highlights 2017-2018
PART A (Non-Calculator)

1. What is the value of $-3 - (-4) + (-10)$?

2. What is the value of $2^3 + 2^0$?

Evaluate the following four expressions.

Expression #1	Expression #2	Expression #3	Expression #4
$-(-2)^3$	-2^3	$-(-3)^2$	$-(-3^2)$

6. Which numbered expression shown above has the largest value and what is that value?

7. What is the value of $\sqrt{\frac{5}{20}}$ expressed as a fraction in simplest form?

8. What is the value of $13.2 + 0.05 - 5.45$?

Consider the inequality $3(x-2) > 4x-5$.

10. How many of the points labelled with a letter on the number line above satisfy the inequality?

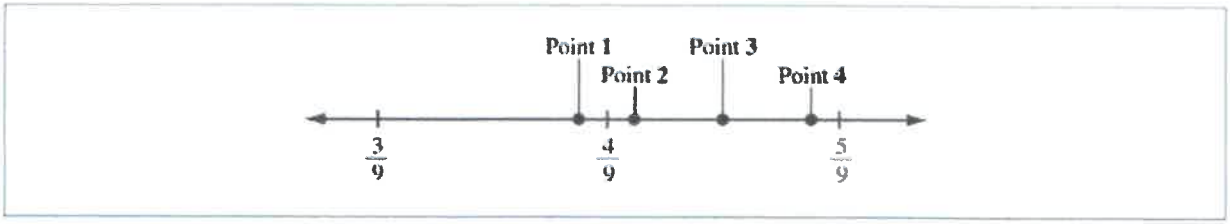
11. To the nearest whole number, what is the approximate square root of 200?

12. What is 150% of 60?

13. In simplest form, what is the value of $4 \times \left(2 + \frac{3}{4}\right)$?

14. Simplify, then evaluate $\frac{(3^4)^3 \times 3^2}{3 \times 3^{10}}$.

15. What is the value of $-\frac{2}{5} + 0.5 + 0.75$ expressed as a fraction in simplest form?



17. Which point best represents the location of $\sqrt{\frac{17}{81}}$ on the number line shown above?

18. What is the value of $(2^3 - 3^2)^2$?

20. What is the value of $\sqrt{\frac{1}{9}} \times \sqrt{\frac{36}{49}} \times \sqrt{49\ 000\ 000}$?

P.A.T. Assessment Highlights 2017-2018
PART A (Non-Calculator)

1. What is the value of $-3-(-4)+(-10)$?

First: $-3-(-4)+(-10)$ → $-1(-4)$ → $+4$; $+1(-10)$ → -10

Second: $-3+4-10 = -3-10+4 = -13+4$

Third: $-13+4$ (subtract) $= -9$

∴ -9

FIRST: WORK OUT THE SIGNS
2nd: "GROUP" THE SAME-SIGN TERMS
3rd: Apply the law of signs for integers
(+) + (+) = +
(−) + (−) = −
(+) + (−) = Subtract. Biggest value "wins"

2. What is the value of 2^3+2^0?

- Law of exponents do not apply to ADDING/SUBTRACTING POWERS
- When adding/subtracting powers → standard form

$2^3 + 2^0 = 8+1 = +9$ (8 and 1)

∴ +9

Remember exponents of 0 result in 1.

Evaluate the following four expressions.

Expression #1	Expression #2	Expression #3	Expression #4
$-(-2)^3$	-2^3	$-(-3)^2$	$-(-3^2)$

6. Which numbered expression shown above has the largest value and what is that value?

See next page

7. What is the value of $\sqrt{\frac{5}{20}}$ expressed as a fraction in simplest form?

- FIRST: Always simplify to lowest term when dealing with fractions
- Second: put the simplified fraction back on √
- Third: Get the square roots

$\frac{5}{20} = \frac{1}{4}$ (Both perfect squares)

$\sqrt{\frac{5}{20}} = \sqrt{\frac{1}{4}}$

$\sqrt{\frac{5}{20}} = \sqrt{\frac{1}{4}} = \frac{\sqrt{1}}{\sqrt{4}} = \frac{1}{2}$

$1\times1=1$ $\sqrt{1}=1$
$2\times2=4$ $\sqrt{4}=2$

∴ $\frac{1}{2}$

8. What is the value of $13.2+0.05-5.45$?

Remember that to add/subtract decimals, the decimal points MUST line up

So: Go LEFT to RIGHT

You can write "0"s in the places missing

$13.20 + 00.05$

13.25 ← lined up

$13.25 - 05.45$

07.80

∴ 7.80

But if you do subtraction first:

$0.05 - 5.45 = 0.05 + (+5.45)$ (add the opposite)

So: $13.2 + (-5.40)$

$13.2 - 5.40$

07.80

#6 EXPRESSION 1: $-(-2)^3$

Base: -2 (negative)
↳ $-$ inside brackets
↳ exp = 1

outside Exponent: 3 (ODD)

EXPRESSION 1: $+8$

Result: Because the base is negative, and the exponent is odd → Negative $(-)(-)(-) = -$

So, $(-2)^3 = -8$, But $-(-8) = -1 \times (-8) = +8$

EXPRESSION 2: -2^3

Outside Exponent: 3

Base: 2 (positive)
↳ negative sign not inside brackets

EXPRESSION 2: -8

Result: Because the base is positive, and the $-$ does not belong to the power, -2^3 Reads "the opposite of 2^3"

So, $-2^3 = -1 \times [2^3] = -8$

EXPRESSION 3: $-(-3)^2$

Base: -3 (negative)
↳ "$-$" inside brackets
↳ exp = 1

outside exponent = 2 (even)

EXPRESSION 3: -9

RESULT: Since the base is negative and, exponent outside is even, then the result is $(+)$ → $(-)(-) = (+)$ from brackets

So, $-(+9) = -9$

EXPRESSION 4: $-(-3^2)$

Base: since the exponent is NOT 1, then base's even if the "$-$" is inside the bracket, the base is $+$.

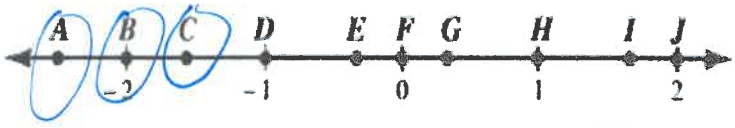
EXPRESSION 4: $+9$

outside exponent: 1

Result: the base is positive so -3^2 is the "opposite" of 3^2

So, $-(-3^2) = -(-9) = -1 \times (-9) = +9$

Consider the inequality $3(x-2) > 4x - 5$.



10. How many of the points labelled with a letter on the number line above satisfy the inequality?

- First (ALWAYS) DISTRIBUTE FIRST

$3(x-2) = 3x - 6$

- Solve the inequality

$3x - 6 > 4x - 5$

$-3x \quad -3x$

$-6 > x - 5$

$+5 \quad +5$

$-1 > x$

x is less than -1 but not $= 1$

11. To the nearest whole number, what is the approximate square root of 200?

$\sqrt{196} = 14$ $\sqrt{200}$ $\sqrt{225} = 15$

- 200 is between the perfect squares 196 and 225
- 200 is much closer to 196 than 225.

12. What is 150% of 60?

Method 2

$150\% = 1.5$

$(1.5)(60) = 90$

100% is 60

50% is half of 60 = 30

$(100 + 50)\% = 60 + 30 = 90$

13. In simplest form, what is the value of $4 \times \left(2 + \frac{3}{4}\right)$?

$\frac{3}{4} = 0.75$ or $\frac{8}{4} + \frac{3}{4} = \frac{11}{4}$

- BRACKETS FIRST

$4 \times \frac{11}{4} = 11$

14. Simplify, then evaluate $\frac{(3^4)^3 \times 3^2}{3 \times 3^{10}}$.

$(3^4)^3 = 3^{4 \times 3} = 3^{12}$

$3 = 3^1$

$\frac{3^{12} \times 3^2}{3^1 \times 3^{10}} = \frac{3^{12+2}}{3^{1+10}} = \frac{3^{14}}{3^{11}} = 3^{14-11} = 3^3 = 27$

Same base → Multiply → add exponents

→ Divide → Subtract exponents

15. What is the value of $-\frac{2}{5} + 0.5 + 0.75$ expressed as a fraction in simplest form?

50

Get same denominator

$-\frac{2}{5} \quad \frac{5}{10} \quad \frac{75}{100}$

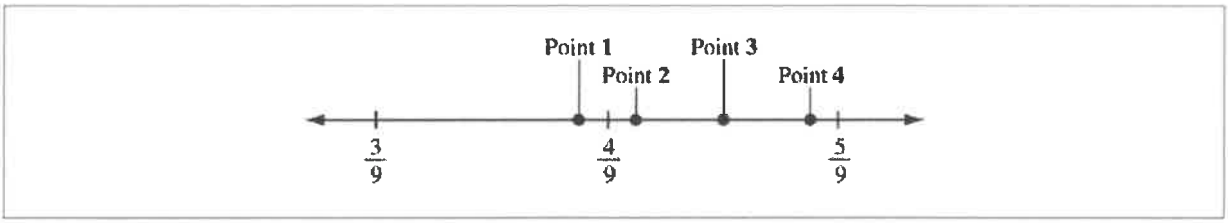
$\left(-\frac{2}{5}\right)^{20}_{20} = -\frac{40}{100} + \quad -\frac{40}{100} + \frac{50}{100} + \frac{75}{100}$

$\left(\frac{5}{10}\right)^{10}_{10} = \frac{50}{100}$

$-40 + 50 + 75$

100

$\frac{85}{100} = \frac{17}{20}$



17. Which point best represents the location of $\sqrt{\frac{17}{81}}$ on the number line shown above?

Approx. $\sqrt{\frac{17}{81}} \approx \sqrt{\frac{16}{81}} = \frac{\sqrt{16}}{\sqrt{81}} = \frac{4}{9}$ but since $\sqrt{17}$ is higher than 4

then → Point 2

18. What is the value of $(2^3 - 3^2)^2$?

Distribute: $2^{3\times2} - 3^{2\times2} = 2^6 - 3^4 \rightarrow 3^4 = 81$

$2^3 \cdot 2^3$

$8 \cdot 8 = 64$

so $64 - 81 = -17$

$6 \rightarrow 70$

$76 \rightarrow 81 \rightarrow 11 \rightarrow 11+6$

17

20. What is the value of $\sqrt{\frac{1}{9}} \times \sqrt{\frac{36}{49}} \times \sqrt{49\ 000\ 000}$?

even amount of 0, so it is perfect square

$\sqrt{\frac{1}{9}} = \frac{\sqrt{1}}{\sqrt{9}} = \frac{1}{3}$

$\sqrt{\frac{36}{49}} = \frac{\sqrt{36}}{\sqrt{49}} = \frac{6}{7}$

$\sqrt{49\ 000\ 000} = 7000$

7 000

So

$\frac{1}{3} \rightarrow \times \frac{6}{7} \rightarrow \times \frac{7000}{1}$

$(6 \times 7) = 42 + 3$ zeroes

$= \frac{42000}{21}$

$42 \div 21 = 2$

2000