

NOMBRE: \_\_\_\_\_

P.A.T Prep  
*Released Non-Calculator  
Practice Questions*

$+$   $-$   
 $\div$   $\times$

KEEP  
CALM  
AND  
DO THE  
MATH

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## 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":

$$4 \div 0.25$$

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:

$$3 \times 2 = 6 \text{ so } 6 \div 2 = 3 \text{ and } 6 \div 3 = 2$$

- 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's 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

$$5^3$$

$$5 \times 3 = 15$$

WRONG!!!

$$5 \times 5 \times 5 = 125$$

RIGHT!!!

- 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.  $6^6 \cdot 6^3$**

$$6^{6+3}$$

Add exponents.

$$6^9$$

**B.  $n^5 \cdot n^7$**

$$n^{5+7}$$

Add exponents.

$$n^{12}$$

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

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

$$3^2 + 3^3 = 3 \times 3 + (3 \times 3 \times 3) = 9 + 27 = 36$$

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

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

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

- If nothing is showing (exponent-wise), it means the exponent is 1!  
*4 is the same as  $(4)^1$*
- Anytime you have  $(\text{base}^{\text{exponent}})^{\text{exponent}}$ , you **MULTIPLY the exponents!**

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

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

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

- 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.

<b>Example:</b>	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:

$$\sqrt{2500} \longrightarrow \sqrt{2500} = \sqrt{25} \times \sqrt{100} \quad \left. \begin{array}{l} \text{half} \\ \text{the} \\ \text{zeros} \end{array} \right\}$$

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

$$= 5 \times 10 = 50$$

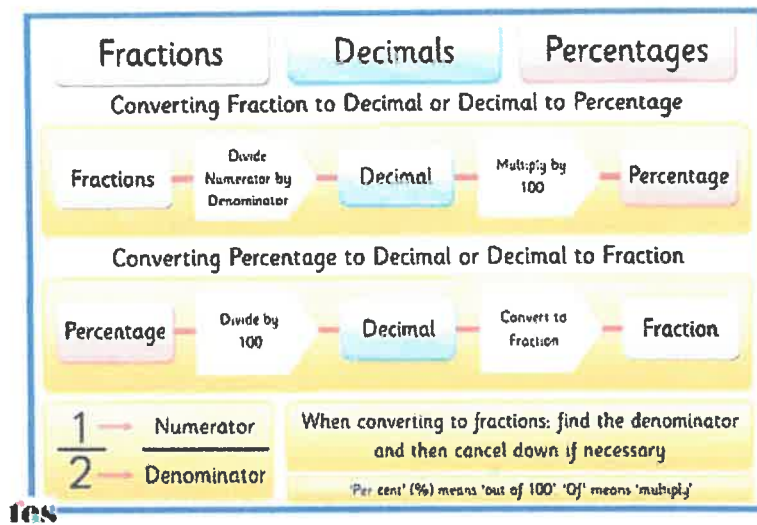
Example 1:

$$\sqrt{1440000} \Rightarrow \sqrt{144 \times 10000} = \sqrt{144} \times \sqrt{10000}$$

• 144 is a perfect square  
• there are 4 zeroes

$$= 12 \times 100 = 1200 \quad \left. \begin{array}{l} \text{half} \\ \text{zeros} \end{array} \right\}$$

## 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.**

$$20\% = 20 \div 100 = .20 = .2 = 0.2 \checkmark$$

$$2\% = 2 \div 100 = .02 = 0.02 \checkmark$$

$$222\% = 222 \div 100 = 2.22 \checkmark$$

$$0.02\% = 0.02 \div 100 = .0002 = 0.0002 \checkmark$$

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

$$0.2 = 0.2 \times 100 = 20\% \checkmark$$

$$0.02 = 0.02 \times 100 = 2\% \checkmark$$

$$2.22 = 2.22 \times 100 = 222\% \checkmark$$

$$0.0002 = 0.0002 \times 100 = 0.02\% \checkmark$$

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

30% of what is 60?

$$0.3 \times \underline{\hspace{2cm}} = 60$$

$$60 / 0.3 = 200$$



## Appendix 2

Tear-Out  
Page

### Grade 9 Mathematics Formula Sheet

The following information may be useful in writing this test.

#### Area (A)

Circle  $A = \pi r^2$

Rectangle  $A = lw$

Triangle  $A = \frac{bh}{2}$

#### Volume (V)

Right Cylinder  $V = \pi r^2 h$

Prism  $V = (\text{Base Area})(h)$

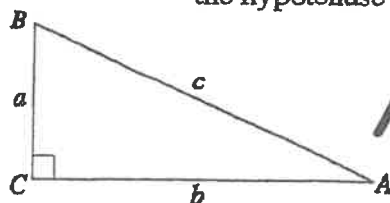
Pyramid  $V = \frac{1}{3}(\text{Base Area})(h)$

#### Circumference (C)

Circle  $C = \pi d$  or  $2\pi r$

#### Pythagorean Theorem

$c^2 = a^2 + b^2$  where  $c$  is the hypotenuse



Make sure you  
Remember:

$C = \sqrt{a^2 + b^2}$  (hypotenuse)

$a = \sqrt{c^2 - b^2}$

Fold and tear along perforation.

Part A: Sample Questions

2018-2019 } 2018-2019 Released Questions

1. What is  $(-2) \times (-1) \times (-3)$ ?

Answer: \_\_\_\_\_

(Record your answer as an **integer** value on the answer sheet.)

2. Evaluate  $(-1)^2 - (-1)^3 - 1^4$ .

Answer: \_\_\_\_\_

(Record your answer as an **integer** value on the answer sheet.)

3. What is the value of  $\frac{(-4)^2 \times (-4)^3 \times (-4)^4}{(-4)^6}$ ?

Answer: \_\_\_\_\_

(Record your answer as an **integer** value on the answer sheet.)

4. What is the value of  $\frac{1}{5} + 0.2 \times \frac{2}{3}$  expressed as a fraction in simplest form?

Answer: 


 (Record the **numerator** in the **first** column)  
(Record the **fraction bar** in the **second** column)  
(Record the **denominator** in the **third** column)

(Record your answer on the answer sheet.)

5. What is the value of  $\frac{25}{75} \times \frac{16}{24} \div \frac{8}{27}$  expressed as a fraction in simplest form?

Answer: 


 (Record the **numerator** in the **first** column)  
(Record the **fraction bar** in the **second** column)  
(Record the **denominator** in the **third** column)

(Record your answer on the answer sheet.)

6. What is the value of  $\frac{1}{8} + 0.25 + 0.5$  expressed as a fraction in simplest form?

Answer: 


 (Record the **numerator** in the **first** column)  
(Record the **fraction bar** in the **second** column)  
(Record the **denominator** in the **third** column)

(Record your answer on the answer sheet.)

7. Given  $(4 \times 5)^7 = 4^{\blacksquare} \times 5^7$ , what is the value of  $\blacksquare$ ?

Answer:  $\blacksquare =$  \_\_\_\_\_

(Record your answer as an **integer** value on the answer sheet.)

8. In simplest form, what is the value of  $\left(3.25 + \frac{3}{4}\right) \div 0.25$ ?

Answer: \_\_\_\_\_

(Record your answer as an **integer** value on the answer sheet.)

9. Solve  $\frac{3}{x} = 0.5$ .

Answer:  $x =$  \_\_\_\_\_

(Record your answer as an integer value on the answer sheet.)

10. Solve for  $x$  in the following equation.

$$2.6 + x = 4x + 1.4.$$

Express your answer to the nearest tenth.

Answer:  $x =$  \_\_\_\_\_

(Record your answer on the answer sheet.)

11. Solve for  $x$  in the following equation.

$$-2(3x - 4) = 2(x + 6).$$

Express your answer to the nearest tenth.

Answer:  $x =$  \_\_\_\_\_

(Record your answer on the answer sheet.)

12. Solve for  $x$  in the following equation.

$$0.4(20 - 10x) = 14x - 28$$

Answer:  $x =$  \_\_\_\_\_

(Record your answer as an integer value on the answer sheet.)

13. Evaluate the expression  $-4(7 - 2x)$ , where  $x = -1$ .

Answer: \_\_\_\_\_

(Record your answer as an integer value on the answer sheet.)

14. What is the approximate square root of

$$\sqrt{\frac{145}{4}}$$
 to the nearest whole number?

Answer: \_\_\_\_\_

(Record your answer on the answer sheet.)

15. Order the following rational numbers from smallest value to greatest value, using the numbers 1, 2, 3, and 4.

Use the number 1 to represent the smallest value and the number 4 to represent the greatest value.

Answer: \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

$$\sqrt{\frac{4}{9}} \quad -1.\overline{5} \quad -1.75 \quad -\frac{8}{5}$$

(Record all four digits of your answer on the answer sheet.)

16. Order the following rational numbers from smallest value to greatest value, using the numbers 1, 2, 3, and 4.

Use the number 1 to represent the smallest value and the number 4 to represent the greatest value.

Answer: \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

$$-0.75 \quad \frac{-3}{-5} \quad -0.\overline{6} \quad -\left(\frac{-5}{-2}\right)$$

(Record all four digits of your answer on the answer sheet.)

17. What is the value of  $0.4 \div 2 + \sqrt{\frac{9}{36}} \times 1\frac{1}{5}$  expressed as a fraction in simplest form?

Answer: 


 (Record the numerator in the first column)  
(Record the fraction bar in the second column)  
(Record the denominator in the third column)

(Record your answer on the answer sheet.)

Use the following information to answer question 18.

Inequality Symbols			
Symbol 1	Symbol 2	Symbol 3	Symbol 4
$>$	$\geq$	$<$	$\leq$

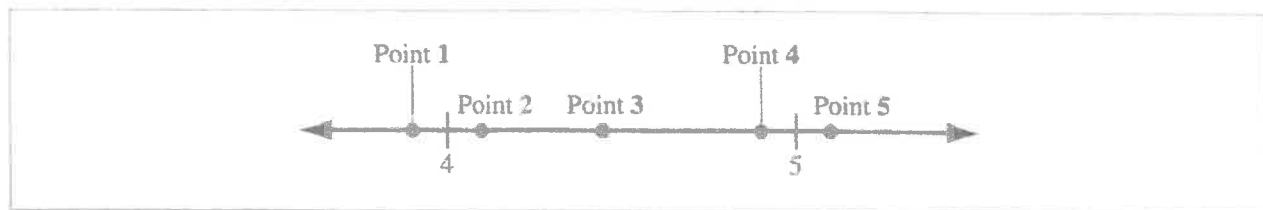
18. Solve the inequality  $10 - 2x \geq -4$ .

Answer:  $x$  \_\_\_\_\_

Symbol number	Value
(Record in the first box)	(Record in the second box)

(Record both digits of your answer on the answer sheet.)

Use the following information to answer question 19.

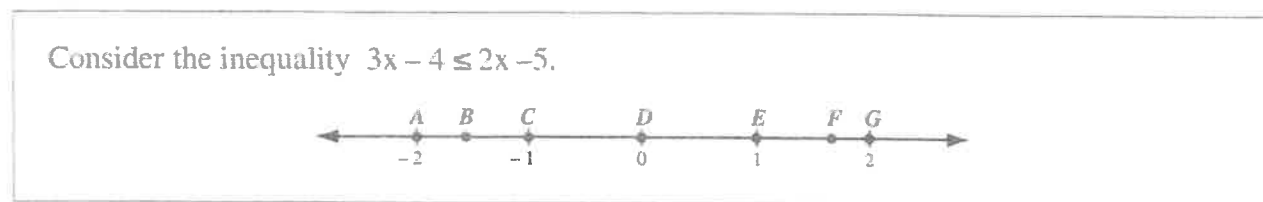


19. Which points best represent an approximate value for  $\sqrt{17}$ ,  $\sqrt{23}$ , and  $\sqrt{27}$ ?

Answer: Point: \_\_\_\_\_  
 Number:  $\sqrt{17}$   $\sqrt{23}$   $\sqrt{27}$

(Record all three digits of your answer on the answer sheet.)

Use the following information to answer question 20.



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

Answer: \_\_\_\_\_ points

(Record your answer on the answer sheet.)

# GRADE 9 MATHEMATICS **Part A**

1  2  3  4  5  6  7

8  9  10  11  12  13  14

15  16  17  18  19  20  S1

(min)

Answer: -6

(Record your answer as an integer value on the answer sheet.)

2019  
Bulletin  
Questions  
Answers

For Multiplication

$$(+)(+) = (+)$$

$$(-)(-) = (+)$$

$$(-)(+) = (-)$$

**STRATEGY:** First, work out the signs:

$$\underbrace{(-) \times (-)}_{(+)} \times (-) = -$$

ALSO  
+ odd amount of negatives  $\rightarrow$  -  
- even amount of positives -

• Work out the numbers:

$$\cancel{2} \times \cancel{1} \times 3 = 2 \times 3 = 6$$

2. Evaluate  $(-1)^2 - (-1)^3 - 1^4$ .

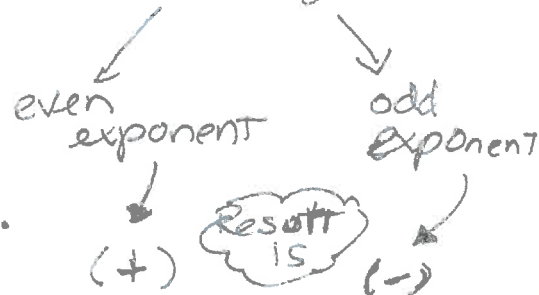
Answer: 1

(Record your answer as an integer value on the answer sheet.)

**Powers**

• A negative base has a negative sign inside brackets

• Base is negative



**Step 1**

$$(-1)^2 = (-1)(-1) = 1 (+)$$

$$(-1)^3 = (-1)(-1)(-1) = -1$$

$1^4$  → the base here is not negative. So, do  $1^4 = 1 \times 1 \times 1 \times 1$  and then carry the (-) sign  $\rightarrow -1$

$$1 - (-1) - 1$$

subtraction  $\rightarrow$  Add the opposite

**STRATEGY 2**

When two signs are next to one another, they multiply!

$$1 + (+) + (-1) = 2 + (-1) = 1$$

Note

Law of Exponents do not apply to the adding and subtracting of Powers !!

of  $\frac{(-4)^2 \times (-4)^3 \times (-4)^4}{(-4)^6}$ ?

Answer: -64

(Record your answer as an integer value on the answer sheet.)

• ONLY applicable TO powers of equal bases.

• ONLY applicable for multiplication and division. NOT for adding/subtracting.

• When multiplying powers (equal bases) → ADD exponents.

• When dividing → SUBTRACT exponents.

## STRATEGY 1

• FIRST, Are the bases equal?

If yes → probably apply Law of exponents.

If not → probably have to use in standard form.

• Second:

Numerator first: Same base  $(-4) \rightarrow (-4)^2 \times (-4)^3 \times (-4)^4$

• Divide:

$$(-4)^9 / (-4)^6 = (-4)^{9-6} = (-4)^{2+3+4} = (-4)^9$$

$$\therefore -64$$

$$= (-4)^3 \rightarrow$$

work out signs:  $(-)(-)(-)$

work out

numbers:  $4 \times 4 \times 4 = 64$

## STRATEGY 2

• When dealing with fractions, you can eliminate "common" multipliers in both numerator and denominator:

$$\text{Ex: } \frac{2 \times 9 \times 3}{2} = 9 \times 3 = 27$$

$$\text{Ex: } \frac{9 \times 4}{3 \times 3 \times 2 \times 2} = \frac{3 \times 3 \times 2 \times 2}{3 \times 3} = 3 \times 2 = 6$$

$$\text{So: } \frac{(-4)^{2+4} \times (-4)^{3+6}}{(-4)^6} = \frac{(-4)^6 \times (-4)^3}{(-4)^6} = (-4)^3 = -64$$

4. What is the value of  $\frac{1}{5} + 0.2 \times \frac{2}{3}$  expressed as a fraction in simplest form?

Answer:  $\frac{1}{3}$  (Record the numerator in the first column)  
 (Record the fraction bar in the second column)  
 $\frac{2}{3}$  (Record the denominator in the third column)

(Record your answer on the answer sheet.)

is in fraction form.

Also: Any time there is more than 1 operation you must use **BEDMAS**.

Strategy: ① convert everything into fractions.  
 ② Simplify ALONG THE WAY  
 ③ When adding → find the COMMON DENOMINATOR  
 ④ Follow **BEDMAS**

⑤ Simplify always

①  $\frac{1}{5} + 0.2 \times \frac{2}{3}$

2 ways

Way 1:  $\frac{1}{5} + \frac{2}{10} \times \frac{2}{3} \rightarrow \frac{1}{5} + \frac{1}{5} \times \frac{2}{3}$  (Simplify now!)

Way 2:  $\frac{1}{5} + \frac{2}{10} \times \frac{2}{3} \rightarrow \frac{1}{5} + \frac{4}{30} \div 2$

Common Denominator:  $\left(\frac{1}{5}\right)^3 + \frac{2}{15}$

$\frac{3}{15} + \frac{2}{15} = \frac{5}{15}$

$\left(\frac{5}{15}\right) \div 5 \rightarrow \frac{1}{3}$

5. What is the value of  $\frac{25}{75} \times \frac{16}{24} \div \frac{8}{27}$  expressed as a fraction in simplest form?

Answer:  $\frac{2}{3}$  (Record the numerator in the first column)  
 (Record the fraction bar in the second column)  
 $\frac{4}{3}$  (Record the denominator in the third column)

(Record your answer on the answer sheet.)

STRATEGY

① Simplify Right away

② Since Division and Multiplication are on Same level:

We can eliminate common



to 21 21

$$\frac{1}{3} \times \left[ \frac{8}{12} \div \frac{8}{27} \right] \rightarrow \frac{8 \times 27}{8 \times 12} = \frac{27 \div 3}{12 \div 3} = \frac{9}{4}$$

$$\frac{1}{3} \times \frac{9}{4}$$

$$\rightarrow \frac{9 \div 3}{12 \div 3} \rightarrow \boxed{\frac{3}{4}} \quad \therefore \frac{3}{4}$$

6. What is the value of  $\frac{1}{8} + 0.25 + 0.5$  expressed as a fraction in simplest form?

Answer: 

1
8

 (Record the numerator in the first column)  
 (Record the fraction bar in the second column)  
 (Record the denominator in the third column)

(Record your answer on the answer sheet.)

### STRATEGY

- Since the answer is in fraction form, convert all decimals to fractions:

$$\bullet 0.25 = \frac{25}{100} = \frac{1}{4}$$

$$\bullet 0.5 = \frac{5}{10} = \frac{1}{2}$$

So:  $\frac{1}{8} + \left(\frac{1}{4}\right)_2 + \left(\frac{1}{2}\right)_4$  Make them fractions of a common denominator!

$$\downarrow$$

$$\frac{1}{8} + \frac{2}{8} + \frac{4}{8} = \boxed{\frac{7}{8}}$$

OR

STRATEGY 2 (add decimals and then convert to fractions!)

$$\frac{1}{8} + (0.25 + 0.5)$$

$$\frac{1}{8} + 0.75 \rightarrow$$

$$0.75 = \frac{75}{100} \xrightarrow{\div 25} = \frac{3}{4}$$

OR

$$1 + \left(\frac{3}{4}\right)_2 = 1 + \frac{3}{2} = \frac{5}{2}$$

7. Given  $(4 \times 5)^7 = 4^{\blacksquare} \times 5^7$ , what is the value of  $\blacksquare$ ?

Answer:  $\blacksquare = 7$

(Record your answer as an integer value on the answer sheet.)

Property of Powers:

$$\text{Ex: } (3 \times 2)^4 = 3^4 \times 2^4$$

$$\text{or } (3^2 \times 2^6)^3 = 3^{2 \times 3} \times 2^{6 \times 3} = 3^6 \times 2^{18}$$

Apply:  $(4 \times 5)^7 = (4^7 \times 5^7) = 4^7 \times 5^7$

$$\boxed{\blacksquare = 7}$$

8. In simplest form, what is the value of

$$\left(3.25 + \frac{3}{4}\right) \div 0.25 \quad \text{means Simplify!}$$

Answer:  $16$

(Record your answer as an integer value on the answer sheet.)

### STRATEGIES

- Convert to the Rational number form that is easier to deal with.
- these decimal numbers are easily added, so:

$$\frac{3}{4} = 0.75$$

$$(3.25 + 0.75) \div 0.25$$

↓

$$4 \div 0.25$$

Mental Division Strategy → Group per Unit (1)

Since, each 1 has 4 (0.25) portions:

- 1 → 4 × 0.25
- 2 → 4 more
- 3 → 4 more
- 4 → 4 more

∴ 16

another way:

$$4 \div 0.25 = 4 \div \frac{25}{100} = 4 \div \frac{1}{4} = 4 \times 4 = 16$$

9. Solve  $\frac{3}{x} = 0.5$ .

Answer:  $x = \underline{6}$

(Record your answer as an integer value on the answer sheet.)

### Strategy 2

By inspection -

$\frac{3}{x} = 0.5$  - we know that  
 $0.5 = \frac{1}{2}$  so

$\frac{3}{x} = \frac{1}{2} \Rightarrow x$  is a number that would allow for the fraction to "simplify" to  $\frac{1}{2}$

$\frac{3}{6}$  because  $\frac{3 \div 3}{6 \div 3} = \frac{1}{2}$

so  $\boxed{x=6}$

$\frac{3}{\frac{1}{2}}$  is

$\hookrightarrow 3 \div \frac{1}{2}$

$\frac{3}{x} = 0.5$

$\rightarrow$  to eliminate the denominator, multiply by  $x$ .

$\frac{3}{x} = 0.5$

$\frac{3}{0.5} = \frac{0.5 \times x}{0.5}$

Now divide by 0.5

$\frac{3}{1} \div \frac{1}{2} = \frac{3 \times 2}{1 \times 1} = 6$

### STRATEGY:

When variable is on both sides, you can move everything at once by using "cross the River"

• Make sure you move the  $x$  so that it's positive

$2.6 + x = \frac{4}{x} + 1.4$   
 changed  $\rightarrow$

$2.6 - 1.4 = 3x$

Mental Division by grouping

• Which number divides 3 that gets 0.5?

• Each "Unit" has 2(0.5)

•  $1 \rightarrow 0.5, 0.5$

$2 \rightarrow 2$  more

$3 \rightarrow 2$  more

6 groups of 0.5

• so  $\boxed{x=6}$

### Strategy 3

Solve equation by using inverse operations

10. Solve for  $x$  in the following equation.

$2.6 + x = 4x + 1.4$

$\frac{1.2}{3} = \frac{12}{3} = 4$   
 with 1 decimal

Express your answer to the nearest tenth.

Answer:  $x = \underline{0.4}$

(Record your answer on the answer sheet.)

$1.2 = 3x$

$1.2 \div 3 = 12 \div 30$

$$-2(3x - 4) = 2(x + 6).$$

Express your answer to the nearest tenth.

Answer:  $x = \underline{-0.5}$

(Not in fraction form)

(Record your answer on the answer sheet.)

$$-2(3x - 4) = 2(x + 6)$$

$$-6x + 8 = 2x + 12$$

$$8 - 12 = 2x + 6x$$

$$-4 = 8x$$

$$-\frac{4}{8} = x$$

simplify

$$x = -\frac{1}{2}$$

Remember: A (-) sign changes the signs of all terms inside the bracket

• "Unlock" the brackets by using the DISTRIBUTIVE property; ex:

$$3(2 + 4) = (3 \times 2) + (3 \times 4)$$

Numbers with numbers, letters with letters!

move everything that's on wrong side!

12. Solve for  $x$  in the following equation.

$$0.4(20 - 10x) = 14x - 28$$

Answer:  $x = \underline{2}$

(Record your answer as an integer value on the answer sheet.)

First → "Unlock" bracket to use terms inside it

BUT...  $0.4 = \frac{4}{10}$ , simplified

$$\frac{2}{5}(20 - 10x) = 14x - 28$$

$$\frac{2}{5} \times 20 - \frac{2}{5}(10x) = 14x - 28$$

$$\frac{40}{5} - \frac{20x}{5} = 14x - 28$$

$$8 - 4x = 14x - 28$$

Now, move terms around

$$8 - 4x = 14x - 28$$

$$28 + 8 = 14x + 4x$$

$$36 = 18x$$

$$10 \dots = 26$$



smallest value to greatest value. using the numbers 1, 2, 3, and 4.

Use the number 1 to represent the smallest value and the number 4 to represent the greatest value.

Answer:  $\frac{2}{-0.75}, \frac{4}{-\frac{3}{5}}, \frac{3}{-0.6}, \frac{1}{-\frac{5}{2}}$

numbers? NO (all are negative.)

② the greatest negative number is the one closer to 0

$\frac{(-)}{(-)} = + \frac{3}{5} = + \frac{60}{100} = 0.6$  (Now, this number is completely positive! the greatest)

$\frac{(-5)}{2} = -\left(2\frac{1}{5}\right) = -2.5$

So:  $-0.75, -0.6$  and  $-2.5$



17. What is the value of  $0.4 \div 2 + \sqrt{\frac{9}{36}} \times \frac{1}{5}$  expressed as a fraction in simplest form?

Answer:  $\frac{4}{5}$  (Record the numerator in the first column)  
 (Record the fraction bar in the second column)  
 (Record the denominator in the third column)

(Record your answer on the answer sheet.)

\* BEDMAS

\* Simplify along the way

\* Fractions should be treated as to have the same denominator

•  $0.4 \div 2 \rightarrow$  Ask yourself, what's half of 0.4? = 0.2

or  $\frac{4}{10} \div \frac{2}{1} = \frac{4}{20} = \frac{1}{5} = 0.2$

•  $\sqrt{\frac{9}{36}} = \frac{\sqrt{9}}{\sqrt{36}} = \frac{3}{6} = \frac{1}{2}$  (Simplified)

•  $1 \frac{1}{5} = \frac{6}{5}$

$0.4 \div 2 + \sqrt{\frac{9}{36}} \times 1 \frac{1}{5}$

$\frac{1}{5} + \left(\frac{1}{2} \times \frac{6}{5}\right) = \left(\frac{1}{5}\right) + \frac{6}{10}$

$\frac{2}{10} + \frac{6}{10} = \frac{8}{10} = \frac{4}{5}$



Inequality Symbols			
Symbol 1 $>$ <i>greater than</i>	Symbol 2 $\geq$ <i>greater or equal to</i>	Symbol 3 $<$ <i>less than</i>	Symbol 4 $\leq$ <i>less and equal to</i>

18. Solve the inequality  $10 - 2x \geq -4$ .

Answer: x 4 7  
 Symbol number Value  
 (Record in the first box) (Record in the second box)

(Record both digits of your answer on the answer sheet.)

• Solve by using inverse operations.

• Same way as solving equations

Reverse sign when ~~dividing~~ multiplying by (-) number

$$10 - 2x \geq -4 - 10$$

$$\frac{-2x}{-2} \geq \frac{-14}{-2}$$

$$x \leq 7$$

x is less or equal to 7

Because we divide by a negative number \* the direction of the sign must be changed

Proofs

$$10 - 2(7) \geq -4$$

$$10 - 14 \geq -4$$

$$-4 \geq -4 \quad \checkmark$$

$$10 - 2(6) \geq -4$$

$$10 - 12 \geq -4$$

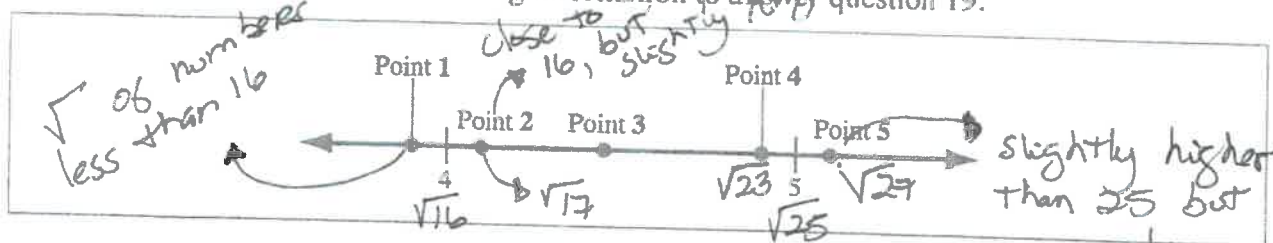
$$-2 \geq -4$$

$$10 - 2(4) \geq -4$$

$$10 - 8 \geq -4$$

$$2 \geq -4$$

Use the following information to answer question 19.



19. Which points best represent an approximate value for  $\sqrt{17}$ ,  $\sqrt{23}$ , and  $\sqrt{27}$ ?

Answer: Point: 2 4 5  
 Number:  $\sqrt{17}$   $\sqrt{23}$   $\sqrt{27}$   
*close to 16* *close less*

(Record all three digits of your answer on the answer sheet)

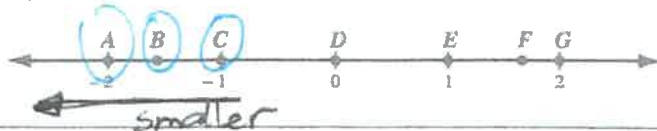
Use the perfect squares you know

$$\sqrt{16} = 4$$

$$\sqrt{25} = 5$$

Use the following information to answer question 20.

Consider the inequality  $3x - 4 \leq 2x - 5$ .



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

Answer: 3 points

(Record your answer on the answer sheet.)

- You only switch the direction of the inequality when a negative number is used to multiply or divide...
- Solve by using inverse operations

$$3x - 4 \leq 2x - 5$$

$+4$                        $+4 \rightarrow -1$

$$3x \leq 2x - 1$$

$-2x$                        $-2x$

$$3x - 2x \leq -1$$

$$x \leq -1$$

so any number equal or smaller than  $-1$ .

any number equal or less than  $-1$ .

Proof:

$$3(-1) - 4 \leq 2(-1) - 5$$

$$-3 - 4 \leq -2 - 5$$

$$-7 \leq -7$$

$$x \leq -2$$

$$3(-2) - 4 \leq 2(-2) - 5$$

$$-6 - 4 \leq -4 - 5$$

$$-10 \leq -9$$

$$x \leq -3$$

$$3(-3) - 4 \leq 2(-3) - 5$$

$$-9 - 4 \leq -6 - 5$$

$$-13 \leq -11$$



# GRADE 9 MATHEMATICS Part A

1 - 6	2 1	3 - 6 4	4 1 / 3	5 3 / 4	6 7 / 8	7 7
8 1 6	9 6	10 0 . 4	11 - 0 . 5	12 2	13 - 3 6	14 6
15 4 3 1 2	16 2 4 3 1	17 4 / 5	18 4 7	19 2 4 5	20 3	S1

## Appendix 1

Only the 0 questions are different

## Part A: Sample Questions

1. What is  $(-2) \times (-1) \times (-3)$ ?

Answer: \_\_\_\_\_  
*answer as integer*

2. What is 30% of 42?

Answer: \_\_\_\_\_

3. What is the value

of  $\frac{(-4)^2 \times (-4)^3 \times (-4)^4}{(-4)^6}$ ?

Answer: \_\_\_\_\_

4. What is the value of  $[-(-3^0)^2 - (2^2)^1]^2$ ?

Answer: \_\_\_\_\_  
*answer as integer*

5. What is  $4^3 - 3^4$ ?

Answer: \_\_\_\_\_  
*answer as integer*

6. Evaluate  $17^2$ .

Answer: \_\_\_\_\_  
*answer as integer*

7. Solve for  $x$  in the following equation.

$$2.6 + x = 4x + 1.4$$

Answer:  $x =$  \_\_\_\_\_

8. Solve for  $x$  in the following equation.

$$0.4(20 - 10x) = 14x - 28$$

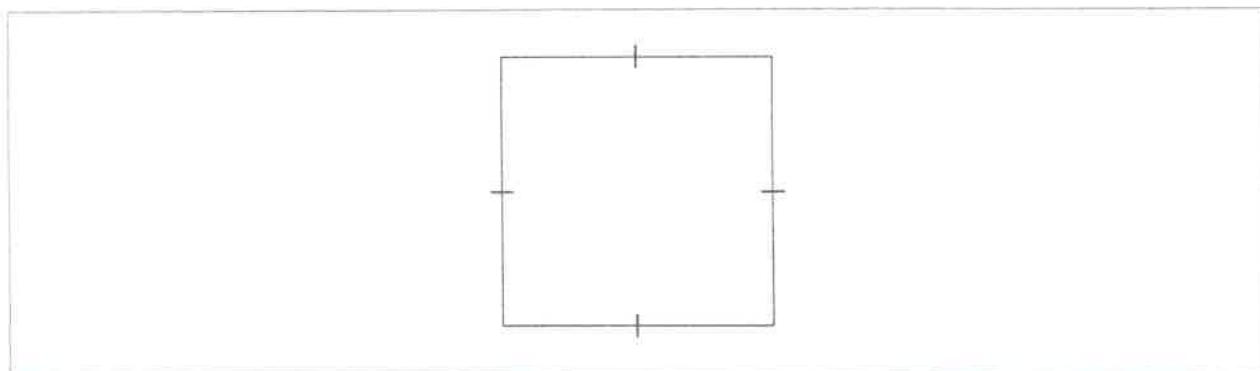
Answer:  $x =$  \_\_\_\_\_

9. What is the approximate square root of  $\sqrt{\frac{145}{4}}$  to the nearest whole number?

**Answer:** \_\_\_\_\_

(Record your answer on the answer sheet.)

*Use the following information to answer question 10.*



10. If the area of the square shown above is  $135 \text{ cm}^2$ , what is the approximate side length to the nearest centimetre?

**Answer:** \_\_\_\_\_

(Record your answer on the answer sheet.)

11. Order the following rational numbers from **smallest** value to **greatest** value, using the numbers 1, 2, 3, and 4.

Use the number 1 to represent the **smallest** value and the number 4 to represent the **greatest** value.

Answer: \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_  
 $\sqrt{\frac{4}{9}}$        $-1.\overline{5}$        $-1.75$        $-\frac{8}{5}$

(Record all **four digits** of your answer on the answer sheet.)

12. What is the value of  $0.4 \div 2 - \sqrt{\frac{9}{36}} \times 1\frac{1}{5}$ ?

Answer: \_\_\_\_\_

(Record your answer on the answer sheet.)

13. Solve for  $x$  in the following equation.

$$2x = 4\left(\frac{1}{4} - \frac{3}{4}x\right) - 6$$

Answer:  $x =$  \_\_\_\_\_

(Record your answer on the answer sheet.)

Use the following information to answer question 14.

$$\begin{array}{cccc}\sqrt{51} & \sqrt{55} & \sqrt{61} & \sqrt{66} \\ \sqrt{71} & \sqrt{77} & \sqrt{81} & \sqrt{88}\end{array}$$

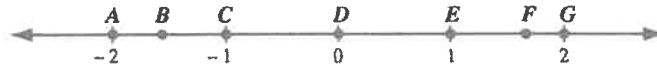
14. How many of the square roots shown above have a value that is between 8 and 9?

Answer: \_\_\_\_\_

(Record your answer on the answer sheet.)

Use the following information to answer question 15.

Consider the inequality  $3x - 4 \leq 2x - 5$ .



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

Answer: \_\_\_\_\_ points

(Record your answer on the answer sheet.)

16. What is the value of  $\frac{1}{5} + 0.2 \times \frac{2}{3}$  expressed as a fraction in simplest form?

Answer:  $\frac{\square}{\square}$  (Record in first column)  
                  (Record in second column)

17. What is the value of  $0.25 + 0.5 + \frac{2}{3}$  expressed as a fraction in simplest form?

Answer:  $\frac{\square\square}{\square\square}$  (Record in 1<sup>st</sup> and 2<sup>nd</sup> column)  
                  (Record in 3<sup>rd</sup> and 4<sup>th</sup> column)

**GRADE 9 MATHEMATICS ACHIEVEMENT TEST**  
**PART A**

1  2  3  4  5  6  7

8  9  10  11  12  13  14

15  16  17  18  19  20  S1

## Solutions to "Unique" Questions Part A 2017 - 2018

- ② What is 30% of 42?

Answer: 12.6  
(Record your answer on the answer sheet)

$$\begin{array}{r} 10\% \text{ of } 42 \rightarrow 4.2 \\ (20\%) \quad 4.2 \\ (30\%) \quad 4.2 \\ \hline 12.6 \end{array}$$

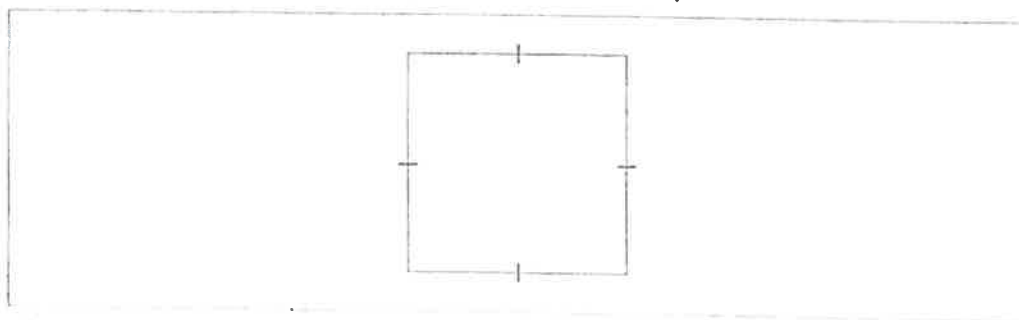
- ④ What is the value of  $\{-(-3^0)^2 - (2^2)^1\}^2$ ?

Answer: -17

(Record your answer as an integer value on the answer sheet)

$$\begin{aligned} &[-(1)^2 - (2^2)^1]^2 = [-1^2 - 2^2]^2 \\ &= -1^4 - 2^4 = -1 - 16 = -17 \end{aligned}$$

Use the following information to answer question 10.



- ⑩ If the area of the square shown above is  $135 \text{ cm}^2$ , what is the approximate side length to the nearest centimetre?

Answer: 12

(Record your answer on the answer sheet.)

Between 11 and 12

$$\begin{array}{ccccc} & & \sqrt{135} & & \\ & \swarrow & & \searrow & \\ \sqrt{121} & & & & \sqrt{144} \\ | & \downarrow & & \downarrow & | \\ 11 & (14) & & (9) & 12 \end{array}$$

$\sqrt{135}$  is closer to  $\sqrt{144}$ , so its closer to 12.



13 What is the largest value of  $(a^b \div a^d)^c$  when the variables in the expression represent the digits 1, 2, 3, and 4? (Each variable can only represent one of the four digits.)

Answer: 81

(Record the answer on the answer sheet.)

$$\left(\frac{a^b}{a^d}\right)^c$$

Since  $a^{b-d}$ ,  $b$  can not be 1  
• To maximize the value, either  
 $a \rightarrow 4$ ,  $b = 2$ ,  $d = 1$  and  $c = 3$

or

$a \rightarrow 3$ ,  $b = 2$ ,  $d = 1$  and  $c = 4$

$$\left(\frac{a^b}{a^d}\right)^c = \left(\frac{4^2}{4^1}\right)^3 = (4)^3 = 4^3 = 4 \times 4 \times 4 = 64$$

$$\left(\frac{a^b}{a^d}\right)^c = \left(\frac{3^2}{3^1}\right)^4 = (3)^4 = 3 \times 3 \times 3 \times 3 = 81$$

Use the following information to answer question 14.

$$\begin{array}{cccc} \sqrt{51} & \sqrt{53} & \sqrt{61} & \sqrt{66} \\ \sqrt{71} & \sqrt{77} & \sqrt{81} & \sqrt{88} \end{array}$$



14 How many of the square roots shown above have a value that is between 8 and 9?

Answer: 3

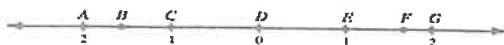
(Record your answer on the answer sheet.)

$\sqrt{66}$ ,  $\sqrt{71}$  and  $\sqrt{77}$   
are between 8 and 9

8 — 9  
 $\sqrt{64}$   $\sqrt{81}$   
so all numbers  
between 64 and 81

Use the following information to answer question 15.

Consider the inequality  $3x - 4 \leq 2x - 5$ .



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

Answer: 3 points

(Record your answer on the answer sheet.)



16 What is the value of  $\frac{1}{5} + 0.2 \times \frac{2}{3}$  expressed as a fraction in simplest form?

Answer: 1 (Record in first column)

3 (Record in second column)

$$\frac{1}{5} + 0.2 \times \frac{2}{3} \rightarrow \frac{1}{5} + \frac{2}{10} \times \frac{2}{3} \rightarrow \frac{1}{5} + \frac{4}{30} = \frac{6}{30} + \frac{4}{30} = \frac{10}{30} = \frac{1}{3}$$



17 What is the value of  $0.25 + 0.5 + \frac{2}{3}$  expressed as a fraction in simplest form?

Answer: 1 (Record in 1st and 2nd column)

12 (Record in 3rd and 4th column)

$$0.25 + 0.5 + \frac{2}{3} \rightarrow \frac{25}{100} + \frac{50}{100} + \frac{2}{3} \rightarrow \frac{1}{4} + \frac{1}{2} + \frac{2}{3} = \frac{3}{12} + \frac{6}{12} + \frac{8}{12} = \frac{17}{12}$$