MA9 Final Review

Name_____

Date_____Blk____

1.1 Squares and Cubes

1. Solve the following:

    a) $5^2 = 5 \cdot 5 = \boxed{25}$ b) $6^3 = 6 \cdot 6 \cdot 6 = \boxed{216}$ c) $9^3 = 9 \cdot 9 \cdot 9 = \boxed{729}$ d) $11^2 = 11 \cdot 11 = \boxed{121}$

2. **Solve.**

    a) $\sqrt{121} = \boxed{11}$ b) $\sqrt[3]{125} = \boxed{5}$ c) $\sqrt{169} = \boxed{13}$ d) $\sqrt[3]{8} = \boxed{2}$

3. Find the square root.

    a) $\dfrac{25}{121} = \dfrac{\sqrt{25}}{\sqrt{121}} = \boxed{\dfrac{5}{11}}$ b) $2.89 = \sqrt{2.89} = \boxed{1.7}$

4. Calculate the number whose square root is:

    a) $\dfrac{5}{7} \rightarrow \boxed{\dfrac{25}{49}}$ b) $1.6 \rightarrow \boxed{2.56}$

5. Determine the value of each square root.

    a) $\sqrt{\dfrac{225}{49}} = \dfrac{\sqrt{225}}{\sqrt{49}} = \boxed{\dfrac{15}{7}}$ b) $\sqrt{\dfrac{9}{25}} = \dfrac{\sqrt{9}}{\sqrt{25}} = \boxed{\dfrac{3}{5}}$

6. Determine the value of each square root.

    a) $\sqrt{6.76} = \boxed{2.6}$ b) $\sqrt{327.61} = \boxed{18.1}$

7. Solve.

    a) $9^2 + \sqrt{225} =$

    $81 + 15 = \boxed{96}$

    b) $\sqrt{121} + 35^2 + 7 =$

    $11 + 1225 + 7 = \boxed{1243}$

2.1 What Is a Power?

1. Identify the base of each power.

    a) 6^3 b) 2^7 c) $(-5)^4$ d) -7^0

    $\boxed{6}$ $\boxed{2}$ $\boxed{(-5)}$ $\boxed{7}$

2. Complete this table.

Power	Base	Exponent	Repeated Multiplication	Standard Form
4^4	4	4	$4 \cdot 4 \cdot 4 \cdot 4$	256
$(-10)^3$	(-10)	3	$(-10) \cdot (-10) \cdot (-10)$	-1000
$(-6)^2$	-6	2	$(-6) \cdot (-6)$	36
4^5	4	5	$4 \times 4 \times 4 \times 4 \times 4$	1024
6^0	6	0		1

3. Write each product as a **power**, then evaluate.

a) 6×6 = 6^2

b) $10 \times 10 \times 10 \times 10$ = 10^4

c) $(-8)(-8)(-8)$ = $(-8)^3$

d) $-(-8)(-8)(-8)$ = $-(-8)^3$

4. Write each power as repeated multiplication, then evaluate.

a) $7^5 = 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 = 16807$

b) $-9^3 = -(9 \cdot 9 \cdot 9) = -729$

c) $(-5)^5 = (-5)(-5)(-5)(-5)(-5) = -3125$

5. Predict whether each answer is positive or negative, then evaluate.

a) $(-3)^2$ pos. 9

b) -3^2 neg. -9

c) $-(-3)^3$ pos. 27

2.2 Powers of Ten and the Zero Exponent

6. Evaluate each power.

a) 4^0 = 1

b) -6^0 = -1

c) $(-1)^0$ = 1

7. Write each number as a power of 10.

a) 10 000 1×10^4

b) 1 000 000 1×10^6

c) ten 1×10^1

d) 1 1×10^0

8. Use powers of 10 to write each number.

a) 700 000 000 000 7×10^{11}

b) 7000 7×10^3

c) 77 077 $(7 \times 10^4) + (7 \times 10^3) + (7 \times 10^1) + (7 \times 10^0)$

9. Write each number in standard form.

a) (8×10^5) = 800000

b) $(9 \times 10^7) + (9 \times 10^6) + (5 \times 10^5)$ 96560000

2.3 Order of Operations with Powers

10. Evaluate.

a) $5^2 + 3$ $25 + 3 = 28$

b) $5 - 3^2$ $5 - 9 = -4$

c) $(5 + 3)^2$ $(8)^2 = 64$

d) $(5 - 3)^2$ $2^2 = 4$

11. Evaluate.

a) $4^3 \times 2$ $64 \cdot 2 = 128$

b) $4^3 \div 2$ $64 \div 2 = 32$

c) $(4 \times 2)^3$ $(8)^3 = 512$

d) $4^3 \times 2^3$ $64 \cdot 8 = 512$

12. Evaluate.

a) $(18 \div 3^2 + 1)^4 - 4^2$

$(18 \div 9 + 1)^4 - 16$

$(2 + 1)^4 - 16 = 3^4 - 16 = 65$

b) $3^3 \div 9(3^0 - 2^2)$

$27 \div 9(1 - 4)$

$27 \div 9(-3) = (3)(-3) = -9$

c) $(7 - 5)^3 \times (8 + 2)^4$

$(2)^3 \cdot (10)^4$

$8 \cdot 10000$

$= 80000$

d) $(4^2 \times 1^5)^2$

$(16 \cdot 1)^2$

$16^2 = 256$

2.4 Exponent Laws I

1. Write each product as a single power.
   a) $4^3 \times 4^2 = 4^{3+2} = \boxed{4^5}$ b) $(-2)^2 \times (-2)^4 = \boxed{(-2)^6}$ c) $-6^3 \times 6^1 = -\boxed{(6^4)}$ d) $(-9)^6 \times (-9)^3 = \boxed{(-9)^9}$

2. Write each quotient as a single power.
   a) $8^7 \div 8^5 = \boxed{8^2}$ b) $10^4 \div 10^0 = \boxed{10^4}$ c) $(-1)^6 \div (-1)^3 = \boxed{(-1)^3}$

   d) $\dfrac{-3^4}{3^4} = \boxed{-3^0}$ e) $\dfrac{(-9)^{10}}{(-9)^5} = \boxed{(-9)^5}$ f) $\dfrac{11^9}{11^6} = \boxed{11^3}$

3. Express as a single power.
   a) $2^3 \times 2^6 \div 2^9$ b) $(-5)^8 \div (-5)^4 \times (-5)^3$ c) $\dfrac{6^3 \times 6^5}{6^2 \times 6^4} = \dfrac{6^8}{6^6} = \boxed{6^2}$

   $\dfrac{2^9}{2^9} = \boxed{2^0}$ $(-5)^4 \cdot (-5)^3 = \boxed{(-5)^7}$

4. Simplify, then evaluate.
   a) $2^2 - 2^0 \times 2 + 2^3$ b) $-2^2(2^3 \div 2^1) - 2^3$
   $4 - 1 \cdot 2 + 8 = 4 - 2 + 8 = \boxed{10}$ $-4(2^2) - 2^3$
                                                       $-4(4) - 8 = -16 - 8 = \boxed{-24}$

5. Simplify, then evaluate.
   a) $4^3 \div 4^2 + 2^4 \times 3^2$ b) $3^2 + 4^2 \times 4^1 \div 2^3$ c) $\dfrac{3^4}{3^3} + \dfrac{4^2 \times 4^0}{2^4}$
   $6^1 + 16 \cdot 9$ $9 + 16 \cdot 4 \div 8$ $3 + \dfrac{4^2}{2^4} \rightarrow 3 + \dfrac{(2^2)^2}{2^4} \rightarrow 3 + \dfrac{2^4}{2^4}$
   $6 + 144 = \boxed{150}$ $9 + 64 \div 8$
                                             $9 + 8 = \boxed{17}$ $\rightarrow 3 + 1 = \boxed{4}$

2.5 Exponent Laws II

6. Write each expression as a product of powers or a quotient of powers.

   a) $(3 \times 2)^4 = \boxed{3^4 \cdot 2^4}$ b) $[(-4) \times 3]^2 = \boxed{(-4)^2 \cdot 3^2}$ c) $[(-2) \times (-4)]^3 = \boxed{(-2)^3 \cdot (-4)^3}$

   e) $(10 \div 5)^3 = \boxed{\dfrac{10^3}{5^3}}$ f) $[(-12) \div (-6)]^2 = \boxed{\dfrac{(-12)^2}{(-6)^2}}$ g) $\left(\dfrac{8}{4}\right)^4 = \boxed{\dfrac{8^4}{4^4}}$

7. Write as a power.
   a) $(3^4)^2 = \boxed{3^8}$ b) $(5^0)^3 = 5^0$ c) $-(7^2)^2 = \boxed{-(7^4)}$ d) $[(-3)^3]^2 = \boxed{(-3)^6}$

8. Simplify, then evaluate.
   a) $(2^3 \times 2^1)^2 = (2^4)^2$ b) $(5^4 \div 5^2)^2 = (5^2)^2 = 5^4$ c) $[(-3)^0 \times (-3)^3]^2$ d) $(10^2)^4 \div (10^3)^2$
   $= 2^8 = \boxed{256}$ $= \boxed{625}$ $[(-3)^3]^2 = (-3)^6$ $\dfrac{10^8}{10^6} = 10^2 = \boxed{100}$
                                                                                       $= \boxed{729}$

9. Simplify, then evaluate each expression.

   a) $(3^2 \times 4^3)^2 - (4^4 \div 4^2)^2$ b) $(5^2 \times 5^0)^3 + (2^5 \div 2^3)^3$
   $(3^4 \cdot 4^6) - (4^2)^2$ $(5^2)^3 + (2^2)^3 = 5^6 + 2^6 = \boxed{15689}$
   $= 331776 - 4^4 = \boxed{331520}$

   c) $[(-1)^3]^4 - [(-1)^4 \div (-1)^3]^2$ d) $(10^6 \div 10^3)^2 + (2^3 \div 2^1)^4$
   $(-1)^{12} - [1 \div -1]^2$ $(10^3)^2 + (2^2)^4$
   $1 - 1 = \boxed{0}$ $10^6 + 2^8 = \boxed{1000256}$

3.1 What Is a Rational Number?

1. Which of the following numbers are equal to $-\frac{4}{5}$?

$\frac{4}{5}$, $-\frac{5}{4}$, $\boxed{\frac{-4}{5}}$, $\frac{-4}{-5}$, $\boxed{-\frac{8}{10}}$

2. Write the rational number represented by each letter as a **decimal**.

$A = \boxed{-1.8}$ $D = \boxed{-0.9}$ $B = \boxed{-0.1}$ $C = \boxed{0.6}$
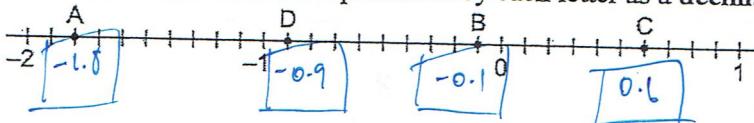
3. Write the rational number represented by each letter as a **fraction**.

$A = -1\frac{4}{5} = -\frac{9}{5}$ $B = \boxed{-\frac{3}{5}}$ $C = \boxed{\frac{2}{5}}$
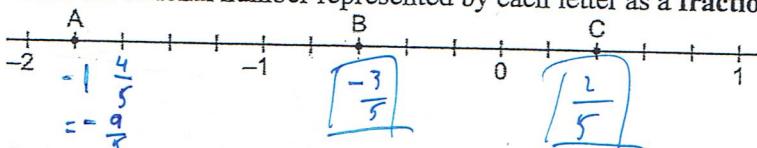
4. Order the numbers from greatest to least.

-2.25, $\frac{5}{4}$, -1.5, $-\frac{1}{8}$, 0.9 $\boxed{\frac{5}{4}, 0.9, -\frac{1}{8}, -1.5, -2.25}$

5. In each pair, circle the greater rational number.

a) -7.3, $\boxed{-7.2}$

b) $\frac{4}{5}$ $\boxed{\frac{5}{4}}$

c) $\boxed{1.2}$, -1.3

d) $\boxed{-\frac{10}{13}}$, $-\frac{10}{11}$ -0.76 -0.90

3.2 Adding Rational Numbers

6. Determine each sum.

a) $-\frac{3}{4} + \frac{1}{2} \times 2$

$\frac{-3}{4} + \frac{2}{4} = \boxed{-\frac{1}{4}}$

b) $-\frac{3}{4} + \left(-\frac{1}{2}\right) \times 2$

$\frac{-3}{4} - \frac{2}{4} = \boxed{\frac{-5}{4}} = \boxed{-1\frac{1}{4}}$

c) $2\frac{2}{5} + \left(-4\frac{1}{2}\right)$

$\frac{12 \times 2 + -9 \times 5}{5 \times 2 \quad 2 \times 5}$ $\frac{24}{10} - \frac{45}{10} = \boxed{\frac{-21}{10}} = \boxed{-2\frac{1}{10}}$

d) $-6\frac{3}{8} + \left(-1\frac{1}{5}\right)$

$\frac{-51 \times 5}{8 \times 1} - \frac{6 \times 1}{5 \times 1} = \frac{-255}{40} - \frac{48}{40} = \frac{307}{40} = \boxed{7\frac{23}{40}}$

7. Determine each sum.

a) $-3.6 + (-21.9)$

$-3.6 - 21.9 = \boxed{-25.5}$

b) $-0.81 + 2.4$

$\boxed{=1.59}$

c) $9.78 + (-13.33)$

$\boxed{= -3.55}$

3.3 Subtracting Rational Numbers

8. Determine each difference. Describe the strategies you used.

a) $-\frac{3}{4} - \frac{1}{2}$

$\frac{-3}{4} - \frac{1}{2} = -0.75 - 0.5$
$= -1.25 = \frac{-5}{4} = \boxed{-1\frac{1}{4}}$

b) $3\frac{3}{5} - \left(-5\frac{1}{2}\right)$

$\frac{18 \times 2}{5 \times 2} + \frac{11 \times 5}{2 \times 5} = \frac{36}{10} + \frac{55}{10} = \boxed{\frac{91}{10}} = \boxed{9\frac{1}{10}}$

9. Determine each difference.

a) $-4.7 - 5.9$

$= \boxed{-10.6}$

b) $0.94 - 1.35$

$= \boxed{-0.41}$

c) $-43.91 - (-9.44)$

$-43.91 + 9.44$
$\boxed{= -34.47}$

3.4 Multiplying Rational Numbers

1. Determine each product.
   a) $(-1.2) \times 0.3 = \boxed{-0.36}$ b) $(-0.6) \times (-0.15) = \boxed{0.09}$

2. Predict the sign of each product. Determine each product.
   a) $\frac{2}{5} \times \left(-\frac{1}{2}\right) = \boxed{-\frac{2}{10}} = \boxed{-\frac{1}{5}}$ b) $\left(-\frac{3}{2}\right) \times \left(\frac{1}{7}\right) = \boxed{\frac{-3}{14}}$ c) $\left(-\frac{3}{4}\right) \times \left(-\frac{4}{5}\right) = \frac{12 \div 4}{20 \div 4} = \boxed{\frac{3}{5}}$

3. Solve.   a) $(1.19)(-13.2) = \boxed{-15.708}$ b) $(-8.65)(-1.6)$

4. Solve.   a) $\left(\frac{10}{7}\right)\left(-\frac{13}{8}\right) = \frac{-130}{56} \div 2 = \boxed{\frac{-75}{28}}$ b) $\left(-4\frac{3}{5}\right)\left(-2\frac{5}{12}\right) = \frac{-23}{5} \cdot \frac{-29}{12} = \boxed{\frac{-667}{60}} \to \boxed{-11\frac{7}{60}}$

$-2\frac{19}{28}$

3.5 Dividing Rational Numbers

5. Determine each quotient.
   a) $(-1.6) \div 0.2 = \boxed{-8}$ b) $(-0.6) \div (-3) = \boxed{0.2}$ c) $(-0.98) \div 12.4 = \boxed{-0.0790}$

6. Calculate each quotient.
   a) $\left(-\frac{2}{3}\right) \div \left(\frac{5}{6}\right) = \frac{-2}{3} \cdot \frac{6}{5} = \frac{-12}{15} = \boxed{\frac{-4}{5}}$ b) $\left(-\frac{3}{4}\right) \div \left(-\frac{5}{2}\right) = \frac{-3}{4} \cdot \frac{-2}{5} = \frac{6}{20} = \boxed{\frac{3}{10}}$ c) $\frac{5}{9} \div \left(-\frac{2}{3}\right) = \frac{5}{9} \cdot \frac{3}{-2} = \frac{15 \div 3}{-18 \div 3} = \boxed{\frac{-5}{6}}$

7. Solve.   a) $3\frac{1}{2} \div \left(-2\frac{1}{6}\right)$ b) $\left(-2\frac{1}{5}\right) \div \left(-4\frac{3}{4}\right)$

$\frac{7}{2} \div \frac{-13}{6} = \frac{42}{-26} = \boxed{\frac{-21}{13}} = \boxed{1\frac{8}{13}}$ $\frac{-11}{5} \div \frac{19}{4} = \frac{-11}{5} \cdot \frac{4}{19} = \boxed{\frac{-44}{95}}$

3.6: Order of Operations with Rational Numbers

8. Evaluate.
   a) $4.5 + 5.1 \div 1.7$ b) $-5.8 - 3.1 \times 0.5$

   $4.5 + 3 = \boxed{7.5}$ $-5.8 - 1.55 = \boxed{-7.35}$

9. a) $\frac{2}{3} \times \left(-\frac{1}{2}\right) + \frac{5}{6}$ b) $\frac{3}{8} - \frac{9}{4} \div \left[\left(-\frac{5}{4}\right) + \left(-\frac{1}{10}\right)\right]$

   $\frac{-2}{6} + \frac{5}{6} = \frac{3}{6} = \boxed{\frac{1}{2}}$ $\frac{3}{8} - \frac{18}{8} \div \left[\frac{-50}{40} - \frac{4}{40}\right]$

   $\frac{-15}{8} \div \frac{-54}{40} = \frac{-15}{8} \cdot \frac{40}{54} = \frac{-75 \div 3}{54 \div 3} = \boxed{\frac{-25}{18}} \boxed{-1\frac{7}{18}}$

10. a) $-4\frac{2}{3} \div \left[\left(-\frac{1}{3}\right) + 4\frac{1}{6}\right] + \left(-3\frac{2}{5}\right)$ b) $\frac{9.6 \times 12.6 - (5.1 \div (-7.4)) - 0.6}{(-2.9) \div 1.3 - (-6.5)}$

   $\frac{-14}{3} \div \left[\frac{-1 \cdot 2 + 25}{3 \cdot 2 \cdot 6}\right] + \frac{-17}{5}$ $\frac{120.96 - (-0.689) - 0.6}{4.2692} = \frac{121.049}{4.2692} = \boxed{28.354}$

   $\frac{-14}{3} \div \left[\frac{-2}{6} + \frac{25}{6}\right] - \frac{17}{5}$

   $\frac{-14}{3} \div \frac{23}{6} - \frac{17}{5}$

   $\frac{-14}{3} \cdot \frac{6}{23} - \frac{17}{5}$ $\frac{-84 \cdot 5 - 17 \cdot 69}{69 \cdot 5 \quad 5 \cdot 69} = \frac{-420 - 1173}{345 \quad 345} = \frac{-1593 \div 3}{345 \div 3} = \boxed{\frac{-531}{115}} = \boxed{-4\frac{71}{115}}$

4.1 Writing Equations to Describe Patterns

1. In each equation, determine the value of A when n is 3.

    a) $A = 2n + 1$ $A = 2(3) + 1 = \boxed{7}$ b) $A = 3n - 2 = 3(3) - 2 = \boxed{7}$ c) $A = 30 - 2n = 30 - 2(3)$

    $= \boxed{24}$

2. The pattern in this table continues. Which equation below relates the value of x to y?

x	1	2	3	4	5
y	11	17	23	29	35

    $\dfrac{\Delta y}{\Delta x} = \dfrac{6}{1} = 6$ $6(1) + 5 = 11$

    $6(4) + 5 = 29$

    a) $y = 6x + 11$ b) $y = 6x + 1$ c) $\boxed{y = 6x + 5}$ d) $x = 6y + 6$

3. The pattern in the table below continues.

x	1	2	3	4	5
y	12	8	4	0	-4

    i) Describe the pattern that relates v to t.

    As y decreases by 4
    x increases by 1

    $\dfrac{\Delta y}{\Delta x} = \dfrac{-4}{1} = -4$

    ii) Write an equation that relates v to t.

    $y = -4x + 16$ $-4(2) + 16 = 8$

    iii) Graph the relation. Label the intervals appropriately.
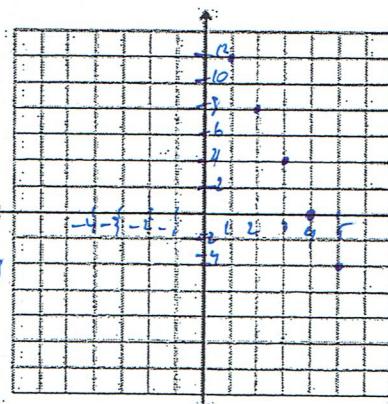
4.2 Linear Relations

4. For each table of values below:
    i) Does it represent a linear relation?
    ii) If the relation is not linear, explain how you know.
    iii) If the relation is linear, describe it.

    a)

x	1	2	3	4	5
y	11	13	17	19	23

    Not a linear relation
    there isn't a constant change.

    b)

x	1	2	3	4	5
y	23	25	27	29	31

    As x increases by 1
    y increases by 2

5. Create a table of values for each linear relation. Use values of x from -2 to 2.

    a) $y = 2x + 3$

x	-2	-1	0	1	2
y	-1	1	3	5	7

    $2(-2) + 3 = -1$
    $2(-1) + 3 = 1$
    $2(0) + 3 = 3$
    $2(1) + 3 = 5$
    $2(2) + 3 = 7$

    b) $y = 11 - 3x$

 | x | -2 | -1 | 0 | 1 | 2 |
    |---|----|----|---|---|---|
    | y | 17 | 14 | 11 | 8 | 5 |

    $11 - 3(-2) = 17$
    $11 - 3(-1) = 14$
    $11 - 3(0) = 11$
    $11 - 3(1) = 8$
    $11 - 3(2) = 5$

4.3 Another Form of the Equation for a Linear Relation

1. Describe the shape of each linear equation (horizontal, vertical or oblique).

   a) $y = -2$ Horizontal

   b) $x = 7$ Vertical

   c) $2x - y = 6$ Oblique

   d) $y = x + 2$ oblique

2. For each equation below:
   Make a table for the given values of x
   Graph the equation.
   Label each graph.

   $y = -3x + 3$

   a) $3x + y = 3$;
   for $x = -2, 0, 2$

   b) $x - 2y = 8$;
   for $x = -2, 0, 2$

   c) $x - 4 = 0$;
   for $x = -2, 0, 2$

   $-3(-2) + 3 = 9$

   $-3(0) + 3 = 3$

   $-3(2) + 3 = -3$

x	y
-2	9
0	3
2	-3
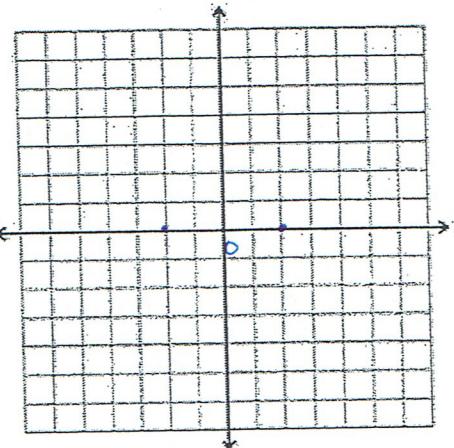
4.4 Matching Equations and Graphs

3. Match each equation with a graph on this grid.

   a) $y = -1$ C

   b) $0 = -x + 1$ → $x = 1$ A

   c) $2 = 2x - 3$ → $2 = 2x - 3$

   $2 + 3 = 2x$

   $\frac{5}{2} = x$ B
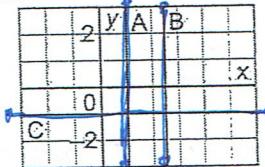
4. Which equation describes this graph? Justify your answers.

   a) $x - y = 4$ → Solve for y ($y = mx + b$)

   b) $x - 4y = 4$ a. $x - y = 4$

   c) $4x - y = 1$ $x - 4 = y$

   $y = x - 4$

   y int is -1 ∴ Not A

   b. $x - 4y = 4$

   $-4y = -x + 4$

   $\frac{-4y}{-4} y = \frac{-x}{-4} + \frac{4}{-4}$
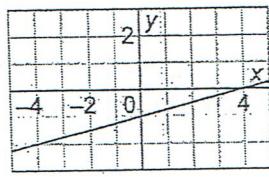
   $y = \frac{x}{4} - 1$

   c. $4x - y = 1$

   $4x - 1 = y$

   $y = 4x - 1$

   B or C
   (same y intercept)

   try a point

   b. (4, 0)   c. (4, 0)

   $y = \frac{x}{4} - 1$ $y = 4x - 1$

   $0 = \frac{4}{4} - 1$ $0 = 4(4) -$

   $0 = 0$ ✓ $0 = 15$

   ∴ B

4.5 Using Graphs to Estimate Values

5. This graph represents a linear relation.

   a) Determine the value of x for each value of y.

   i) $y = 1$ ii) $y = 3$ iii) $y = 0$
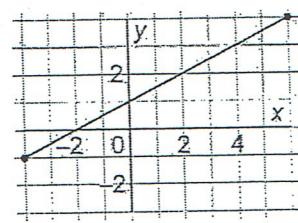
   $x = 0$ $x = 4$ $x = -2$

   b) Determine the value of y for each value of x.

   i) $x = 2$ ii) $x = 8$ iii) $x = -6$

   $y = 2$ $y = 4$ $y = -1$

6. This graph represents a linear relation.

   a) Determine the value of x for each value of y.

   i) $y = 3$ ii) $y = -2$ iii) $y = 7$

   $x = 1$ $x = -1.5$ $x = -3$

   b) Determine the value of y for each value of x.

   i) $x = 0$ $x = -1$ ii) $x = -2$ $x = -3$ iii) $x = -4$

   $y = 1$ $y = -1$ $y = -3$ $y = -5$ $y = -7$

   +2   +2   +2   +2
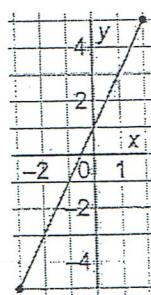
5.1 Modelling Polynomials

1. Circle the polynomials in the following expressions.

   a) $2m^2 + 1$ ⟵circled **b)** $3x^{\frac{1}{2}}$ **c)** $-4x$ ⟵circled **d)** $\dfrac{1}{x^2 + x}$ **e)** $0.25y^2$ ⟵circled

2. For each polynomial, identify the coefficient, variable(s), degree, and constant term.

Polynomial	Coefficient	Variable (s)	Degree	Constant term
$-8y$	-8	y	1	None
12	None	None	0	12
$-2b^2 - b + 10$	-2 and -1	b	2	10
$-4 - b$	-1	b	1	-4

3. Identify each polynomial as a monomial, binomial, or trinomial.

   a) $19t$ — monomial **b)** $g - 4g^2 + 5$ — trinomial **c)** $-1 + xy + y^2$ — trinomial **d)** $4 - 11w$ — binomial

4. Match the equivalent polynomials.

   a) $-h^2 - 3 + 4h$ (i)
   b) $5m - 3$ (iii)
   c) $y^2 + 5xy - 2$ (ii)

     i. $-3 + 4h - h^2$
     ii. $-2 + y^2 + 5xy$
     iii. $-3 + 5m$

5. Use algebra tiles to model each polynomial. Sketch the tiles.

   a) $-5 + y^2$ **b)** $2x - 1$ **c)** $-3a^2 - 2a + 1$ **d)** $3z$

6. Write a polynomial to match the following conditions.

   a) 2 terms, degree 1, with a constant term of 4
     $3x + 4$ More than one correct answer

   b) 3 terms, degree 2, with the coefficient on the 2nd degree term -2
     $\boxed{-2y^2 + 5y + 3}$ More than one correct answer

5.2 Like Terms and Unlike Terms

7. Simplify each polynomial.

   a) $4 + x + 1 + 5x + 1$
     $\boxed{6x + 6}$

   b) $-3y^2 + 3y - 2$

   c) $7d - 2d + 1 - 6$
     $\boxed{5d - 5}$

   d) $2x^2 + 8 - 11 - 4x^2 + 5x^2$
     $\boxed{3x^2 - 3}$

   e) $3p - 6 - 4p + 6$
     $\boxed{-p}$

   a) $3a^2 - 2a - 4 + 2a - 3a^2 + 5$
     $\boxed{1}$

8. Match the equivalent polynomials.

   a) $-5y^2 - 3y - 4$ (ii)
   b) $1 + x - x^2$ (iii)
   c) $-7 + 5x - 7x - 8 + 14 + 12x$
     $10x - 1$ (i)

     i. $10x - 1$
     ii. $2y^2 - 4 - 16 - 7y^2 - 3y + 16$ $= -5y^2 - 3y - 4$
     iii. $5x^2 + 7 + 4x - 6x^2 - 6 - x - 2x$ $= -x^2 + x + 1$

5.3 Adding Polynomials

9. **a)** $(-4h + 1) + (6h + 3)$
     $-4h + 1 + 6h + 3$
     $\boxed{2h + 4}$

   b) $(2a^2 + a) + (-5a^2 + 3a)$
     $2a^2 + a - 5a^2 + 3a$
     $\boxed{-3a^2 + 4a}$

   c) $(3y^2 - 2y + 5) + (-y^2 + 6y + 3)$
     $3y^2 - 2y + 5 - y^2 + 6y + 3$
     $\boxed{2y^2 + 4y + 8}$

   d) $(3 - 2y + y^2) + (-1 + y - 3y^2)$
     $3 - 2y + y^2 - 1 + y - 3y^2$
     $\boxed{-2y^2 - y - 2}$

   e) $(3m^2 + m) + (-10m^2 - m - 2)$
     $3m^2 + m - 10m^2 - m - 2$
     $\boxed{-7m^2 - 2}$

   f) $(-3d^2 + 2) + (-2 - 7d^2 + d)$
     $-3d^2 + 2 - 2 - 7d^2 + d$
     $\boxed{-10d^2 + d}$

5.4 Subtracting Polynomials

1. a) $(4x + 2) - (2x + 1)$

$4x + 2 - 2x - 1$

$\boxed{2x + 1}$

b) $(4x + 2) - (-2x + 1)$

$4x + 2 + 2x - 1$

$\boxed{6x + 1}$

c) $(4x + 2) - (2x - 1)$

$4x + 2 - 2x + 1$

$\boxed{2x + 3}$

d) $(2s^2 + 3s + 6) - (s^2 + s + 2)$

$2s^2 + 3s + 6 - s^2 - s - 2$

$\boxed{s^2 + 2s + 4}$

e) $(2s^2 + 3s - 6) - (s^2 + s - 2)$

$2s^2 + 3s - 6 - s^2 - s + 2$

$\boxed{s^2 + 2s - 4}$

f) $(-2s^2 + 3s + 6) - (-s^2 + s + 2)$

$-2s^2 + 3s + 6 + s^2 - s - 2$

$\boxed{-s^2 + 2s + 4}$

5.5 Multiplying and Dividing a Polynomial by a Constant

2. Multiply.

a) $2(3b)$ $\boxed{=6b}$

b) $-2(6h) = \boxed{-12h}$

c) $4(2b^2)$ $\boxed{=8b^2}$

d) $-2(2x^2) = \boxed{-4x^2}$

e) $-2(-y^2) \boxed{=2y^2}$

f) $-3(-2f) = \boxed{6f}$

g) $4(3a + 2)$ $\boxed{=12a + 8}$

h) $(d^2 + 2d)(-3) \boxed{= -3d^2 - 6d}$

i) $2(4c^2 - 2c + 3) = \boxed{8c^2 - 4c + 6}$

3. Divide.

a) $12d \div 4$ $= \boxed{3d}$

b) $-20d \div 5 = \boxed{-4d}$

c) $8d \div -4 = \boxed{-2d}$

d) $12y^2 \div 4 = \boxed{3d^2}$

e) $-14x^2 \div 2 = \boxed{-7x^2}$

f) $-10q \div -5 = \boxed{2q}$

g) $(16v + 16) \div (8) = \boxed{2v + 2}$

h) $(25k^2 - 15k) \div (5)$

$\boxed{= 5k^2 - 3k}$

i) $(20 - 8n) \div (-4)$

$= -5 + 2n$

$\boxed{= 2n - 5}$

5.6 Multiplying and Dividing a Polynomial by a Monomial

4. Write the multiplication sentence modelled by each rectangle.

a)

$3d + 4$

$2d$ $(3d + 4)(2d)$

b)

$4y + 6$

y $y(4y + 6)$

5. Multiply.

a) $v(3v + 1) = \boxed{3v^2 + v}$

b) $3c(5c + 2) = \boxed{15c^2 + 6c}$

c) $(8 + 4y)(6y) = 48y + 24y^2 \to \boxed{24y^2 + 48y}$

d) $5p(-5 - 2p)$

$\boxed{-25p - 10p^2}$

e) $(7k - 3)(-m)$

$\boxed{= -7km + 3m}$

f) $(-1 - 10r)(-r)$

$= r + 10r^2 \to \boxed{10r^2 + r}$

6. Divide.

a) $(6x + 3) \div 3$

$\boxed{2x + 1}$

b) $(14w - 7) \div -7$

$\boxed{-2w + 1}$

c) $(-15 - 10q) \div 5$

$-3 - 2q \to \boxed{-2q - 3}$

d) $(8z^2 + 4z) \div 2z$

$\boxed{4z + 2}$

e) $(12c^2 - 6c) \div 3c$

$\boxed{4c - 2}$

f) $(9xy - 6x) \div -3x$

$\boxed{3y + 2}$

6.1 Solving Equations by Using Inverse Operations

1. Solve each equation.

a) $-27.25 = c + 2.25$

$-27.25 - 2.25 = c$

$\boxed{-29.5 = c}$

b) $3x = 15.6$

$x = \dfrac{15.6}{3}$

$\boxed{x = 5.2}$

c) $-76.05 = -9b$

$\dfrac{-76.05}{-9} = b$

$\boxed{b = 8.45}$

2. a) $\dfrac{w}{4.5} = -3.5$

$w = (-3.5)(4.5)$

$\boxed{w = -15.75}$

b) $\dfrac{d}{7} - 3 = 11$

$\dfrac{d}{7} = 11 + 3$

$\dfrac{d}{7} = (14)7$

$\boxed{d = 98}$

c) $-16 = \dfrac{p}{6} + 2$

$-16 - 2 = \dfrac{p}{6}$

$6(-18) = p$

$\boxed{p = -108}$

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

$-4 + 2x = -6$

$2x = -6 + 4$

$2x = -2$

$\boxed{x = -1}$

b) $3.2(v - 3) = 12.8$

$3.2v - 9.6 = 12.8$

$3.2v = 12.8 + 9.6$

$v = \dfrac{12.8 + 9.6}{3.2}$

$\boxed{v = 7}$

c) $6\left(m - \dfrac{1}{9}\right) = \dfrac{55}{12}$

$6m - \dfrac{6}{9} = \dfrac{55}{12}$

$6m = \dfrac{55}{12} + \dfrac{6}{9} \div 3$

$6m = \dfrac{55}{12} + \dfrac{2 \cdot 4}{3 \cdot 4}$

$\dfrac{6m}{6} = \dfrac{55}{12} + \dfrac{8}{12}$

$m = \dfrac{63}{12} \div 6$

$m = \dfrac{63}{12} \cdot \dfrac{1}{6} = \dfrac{63}{72} = \boxed{\dfrac{63}{72}}$

6.2 Solving Equations by Using Balance Strategies

4. Solve each equation.

a) $3y - 6 = 9y$

$3y - 6 + 6 = 9y + 6$

$3y - 9y = 9y - 9y + 6$

$\dfrac{-6y}{-6} = \dfrac{6}{-6}$

$\boxed{y = -1}$

b) $2a - 4 = -3a$

$2a - 4 + 4 = -3a + 4$

$2a + 3a = -3a + 3a + 4$

$\dfrac{5a}{5} = \dfrac{4}{5}$

$\boxed{a = \dfrac{4}{5}}$

c) $-14.3 + 2c = -c + 4.9$

$+14.3 - 14.3 + 2c = -c + 4.9 + 14.3$

$2c + c = -c + c + 19.2$

$\dfrac{3c}{3} = \dfrac{19.2}{3}$

$\boxed{c = 6.4}$

5. Solve each equation.

a) $2(h - 1) = -3(h + 3)$

$2h - 2 = -3h - 9$

$2h + 3h = -9 + 2$

$5h = -7$

$h = \dfrac{-7}{5}$

$\boxed{h = -1\tfrac{2}{5}}$

b) $4.1(2 - y) = -1.025(y - 0.5)$

$8.2 - 4.1y = -1.025y + 0.5125$

$-4.1y + 1.025y = 0.5125 - 8.2$

$\dfrac{-3.075y}{-3.075} = \dfrac{-7.6875}{-3.075}$

$\boxed{y = 2.5}$

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

$\dfrac{6x}{4} - \dfrac{9}{4} = \dfrac{18x}{5} + \dfrac{6}{5}$

$\dfrac{6x \cdot 5}{4 \cdot 5} - \dfrac{18x \cdot 4}{5 \cdot 4} = \dfrac{6 \cdot 4}{5 \cdot 4} + \dfrac{9 \cdot 5}{4 \cdot 5}$

$\dfrac{30x}{20} - \dfrac{72x}{20} = \dfrac{24}{20} + \dfrac{45}{20}$

$\dfrac{-42x}{20} = \dfrac{69}{20}$

$x = \dfrac{69}{20}\left(\dfrac{20}{-42}\right)$

$x = \dfrac{69}{-42} = \boxed{-1\tfrac{9}{14}}$

7.1 Scale Diagrams and Enlargements

1. *Scale factor =* $\dfrac{\text{length of scale diagram (copy)}}{\text{length of original}}$

Length of original	Length of scale diagram	Scale factor
12 cm	$5 = \dfrac{x}{12} \rightarrow x = 60$	5
0.4 cm	$\dfrac{7}{3} = \dfrac{x}{0.4} \rightarrow x = \left(\dfrac{7}{3}\right)(0.4)$ $x = 0.9333$	$\dfrac{7}{3}$
1.5 cm	35 cm	$\dfrac{35}{1.5} = 23.\overline{3}$
$4.75 = \dfrac{25}{x} \rightarrow x = 25$ $\boxed{x = 5.26} \, 4.75$	25 mm	4.75

2. Find the unknown variable, y.

a) $\dfrac{y}{11} = \dfrac{19}{45}$

$y = \dfrac{(19)(11)}{45} \quad \boxed{y = \dfrac{209}{45}}$

b) $\dfrac{5.25}{y} = \dfrac{5}{8}$

$y = \dfrac{(8)(5.25)}{5}$

$\dfrac{y}{5.25} = \dfrac{8}{5} \quad \boxed{y = \dfrac{42}{5}}$

c) $\dfrac{5}{y} = \dfrac{3}{11} \neq \dfrac{8}{45}$

$\dfrac{y}{5} = \dfrac{11}{3}$

$\boxed{y = \dfrac{55}{3}}$

3. Which rectangles are similar? Give reasons for your answer.

4.5 cm, 2.7 cm, A: $\dfrac{4.5}{2.7} = 1.6$

2.7 cm, 1.8 cm, B: $\dfrac{2.7}{1.7} = 1.5$

1.5 cm, 0.9 cm, C: $\dfrac{1.5}{0.9} = 1.6$
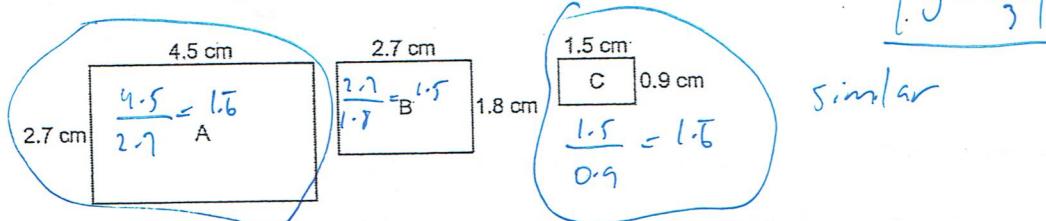
similar

4. A tree is 4.7 m tall has a shadow that is 3.2 m long. At the same time, a building has a shadow that is 12 m long. Determine the height of the building to the nearest tenth of a metre. Draw a diagram.
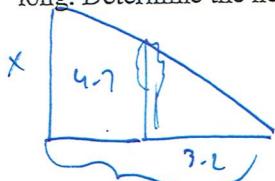
$\dfrac{x}{12} = \dfrac{4.7}{3.2}$

$x = \dfrac{(12)(4.7)}{3.2} = 17.6 \, m$

5. Determine the length of XY in the pair of similar triangles. What is the scale factor?
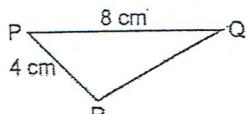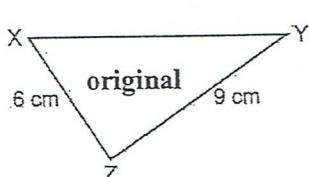
$6 : 4$

$1 : \dfrac{2}{3}$

scale factor $= \dfrac{4}{6} \, \boxed{= \dfrac{2}{3}}$

$XY : 8$

$1 : \dfrac{2}{3}$

$\dfrac{XY}{1} = 8 \div \dfrac{2}{3}$

$XY = 8 \cdot \dfrac{3}{2}$

$\boxed{XY = 12}$

6. Find the unknown side length, x.
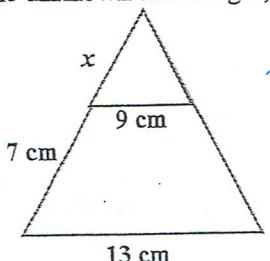
$\dfrac{7+x}{13} = \dfrac{x}{9}$

$7 + x = \dfrac{13x}{9}$

$7 = \dfrac{13x}{9} - x$

$7 = \dfrac{13x}{9} - \dfrac{9x}{9}$

$\dfrac{4x}{9} = 7$

$4x = 63$

$x = \dfrac{63}{4} \rightarrow \boxed{15\dfrac{3}{4}}$

C8 Financial Literacy

1. Solve. Round to two decimal places.

   a) 2.3% of $16

   $(16)(0.023) = \boxed{0.37}$

   b) 12% of $217

   $(0.12)(217) = \boxed{26.64}$

   c) 0.19% of $587

   $(0.0019)(587) = \boxed{1.12}$

2. Bryan has several part-time jobs. Complete the table to determine Bryan's weekly earned income.

Job	Hourly Pay	Hours worked	Weekly Income
Paint store assistant	$12.00	4	48
Tutor	$11.50	6	69
Life Guard	$23.25	7	162.75
Total Weekly Income			$279.75

   b) What is Bryan's total monthly income?

   $(\$279.75)(4) = \$1119$

   c) How long would it take Bryan to save $1500 if he spends 35% of his total monthly income?

   $(0.35)(1119) = \$391.65$

   $\dfrac{\$1500}{\$391.65} = 3.83$ It would take 4 months

3. Use the **simple interest formula, $I = PRT$,** to solve the following. Show your work.

a) $888 is put into a savings account earning 1.5% interest for per annum. How much **interest** will the account earn?

   $I = PRT = (888)(0.015)(1) = \boxed{\$13.32}$

b) What **principal** invested at 1.05% simple interest will earn $120 at the end of three years?

   $I = PRT$

   $120 = P(0.0105)(3)$

   $\dfrac{120}{(0.0105)(3)} = P$ $\boxed{P = \$3809.52}$

c) What **interest rate** will allow $500 to earn $75 interest in 3 years?

   $75 = (500)(r)(3)$

   $\dfrac{75}{1500} = r$ $r = 0.05$ $\therefore \boxed{5\%}$

d) How long will it take an investment of $1000 at 2.05% interest per annum to earn $88?

   $88 = (1000)(0.0205)(t)$

   $\dfrac{88}{(1000)(0.0205)} = t$ $t = 4.29$

   If it is per annum (yearly), then it would take 5 years

4. Below is a list of bank transactions.

a) Enter the amounts for each transaction in the appropriate column marked debits or credits.
b) Complete the "Balance" column for the bank statement.
c) Complete the boxes marked "Debits", "Credits", and "Balance" at the end of the statement.

- Save-On-Foods, $120.00
- Direct deposit, $435.52
- ATM withdrawal, $40.00
- ATM charge, $2.50
- Bank machine fee, $1.50
- Tim Horton's, 8.95
- The Bay, $59.99
- Cash Deposit, $95.00
- Direct Deposit, $564.84
- Phone/Internet, $55.75
- Account Fee, $9.95

Date	Details	Debits (−)	Credits (+)	Balance
Mar 1	Opening balance			22.50
Mar 2	Save-On-Foods	120		−97.5
Mar 5	Direct deposit		435.52	338.02
Mar 7	ATM withdrawal	40		298.02
Mar 8	ATM charge	2.5		295.52
Mar 8	Bank machine fee	1.5		294.02
Mar 8	Tim Horton's	8.95		285.07
Mar 8	The Bay	59.99		225.08
Mar 10	Cash deposit		95	320.08
Mar 19	Direct Deposit		564.84	884.92
Mar 25	Phone/Internet	55.75		829.17
Mar 31	Account Fee	9.95		819.22
End of Statement	TOTAL	Debits: $ 297.64	Credits: $ 1095.36	Balance: $ 819.22

$$+ 22.50$$
(opening balance)

5. Myles has two investment options.

- Option A: Invest $1500 in a term deposit that pays 3.25% simple interest for 6 years.
- Option B: Invest $1200 in a term deposit that pays 2.45% simple interest for 5 years.

Which investment option will earn the most interest? By how much more?

$A \Rightarrow I = (1500)(0.0325)(6) = 292.5$

$B \rightarrow I = (1200)(0.0245)(5) = 147$

Option A would earn the most interest by $145.5

$292.5 - 147 = 145.5$

6. Ava wants to buy an I-Pad. The regular price of the IPad is $599.99.
   a) What is the total cost (include 12% tax) of Ava's IPad at the regular price?

$(599)(0.12) = 71.88$ Reg. price $= 599.99 + 71.88 = 671.87

   b) Ava receives a flyer in the mail from Sam's Electronics. There is a one day sale: 20% off the regular price of the IPad. What is her total cost if she buys the IPad at Sam's?

$(0.20)(671.87) = 134.37$

$671.87 - 134.37$
$537.50   (Assuming there is a 12% tax at Sam's)

   c) Ava searches the internet for a better deal. Tech's Place has the IPad listed at $599.99, plus a $100 discount coupon on all electronic devices, after taxes. Which store has the better deal?

$599.99 - 100 = 499.99

price After taxes

∴ Tech's Place has a better deal

C9 Probability & Data Analysis

1. Oscar, Ethan and Joaquin **each** have a deck of playing cards.
   Each student randomly draws a card from the deck. Find the probability of each event:

   a) Each student draws a club.

   b) Oscar draws a red card, Ethan draws a king, and Joaquin draws the Ace of spades.

   Ignore

   c) Oscar draws a heart, Ethan draws a face card, and Joaquin draws an ace.

2. John has tried several times to contact a certain phone provider. He gives them a poor customer service rating. His assumption is based on _____ probability.

3. Several factors can affect data collection. Match the factor to the key words that best describes it.

   a. bias
   b. use of language
   c. privacy
   d. cultural sensitivity
   e. ethics
   f. cost
   g. timing:
   h. time

   sufficient time
   It's personal!
   intended use
   does not apply to a particular group
   when data is collected
   a view point that is in favor or against
   phrased to lead people to respond in a particular way
   too expensive
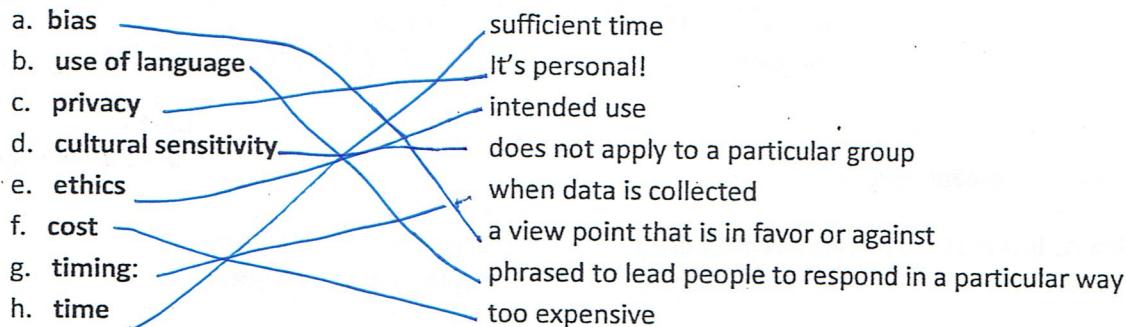
4. Determine whether a sample or population was used to collect data. Is the conclusion valid?

   a. Find the average salary of all Canadians.

   Population → valid

   b. 85% of the Grade 9s responded to a schoolwide survey to determine whether music should be played during lunch hour.

   Sample → Invalid (Assuming the HS includes grades 8 - 12)

   c. The school board polls your school to decide whether cell phones should be banned across the province.

   Sample → Invalid (one school out of all the school in BC ∴ the sample is too small)

5. Fill in the blank with the appropriate sampling method.
   a. *Random Sample* : gives each member of the population an equal chance of being selected.
   b. *Voluntary response* : only members who are interested will participate
   c. *Systematic* : the 5th person who enters the store is surveyed.
   c. *Convenience* : you survey your friends