

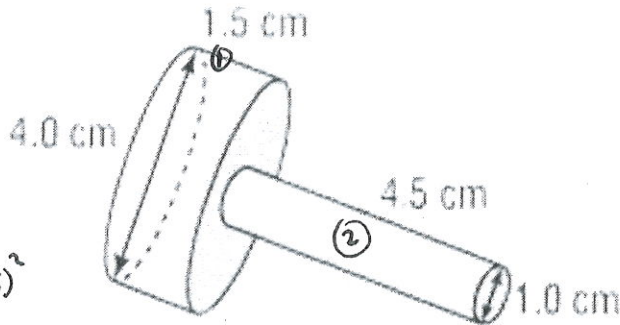
Grade Nine Mathematics 2016 Midterm Exam Review

Name: KEY

UNIT 1: SQUARE ROOTS AND SURFACE AREA

- Solve $\sqrt{\frac{16}{25}}$ and $\sqrt{\frac{81}{49}}$ (a) $\frac{4}{5}$ (b) $\frac{9}{7}$
- What is the square root of 9? $\sqrt{9} = 3$
- What is the square of 16? $16^2 = 256$
- Find the number that has a square root of $\frac{6}{13}$. $\frac{6}{13} \times \frac{6}{13} = \frac{36}{169}$
- Find the square root of $\frac{25}{36}$. $\sqrt{\frac{25}{36}} = \frac{5}{6}$
- Show, and explain, how to determine a reasonable estimate for $\sqrt{\frac{105}{63}}$. $\approx \sqrt{\frac{100}{64}} = \frac{10}{8}$
- Show how to find a number that has a square root between 2.2 and 2.3. $\overbrace{2.25}^{2.2 < 2.25 < 2.3} \times 2.25 = 5.0625$
- Determine a reasonable estimate for $\sqrt{0.05} \approx \sqrt{0.04} = 0.2$
- A student said that $\sqrt{28}$ was between 25 and 36. Is this student correct? *No. It's between $\sqrt{25}$ and $\sqrt{36}$*
- You are covering the top of a square stool with felt. The area of the top is 270 cm². Estimate the length of one side of the top of the stool. Based on your estimate, would 60 cm of trim be enough to completely go around the top of the stool? Explain.
 $\text{one side} = \sqrt{\text{Area}} = \sqrt{270} = 16.4$
 $16.4 \times 4 = 65.6 \dots \text{you do not have enough.}$
- Jordan wants to make a square flower bed that is 121 m². What is the perimeter of the flower bed?
 $\text{side} = \sqrt{\text{Area}} = \sqrt{121} = 11\text{m}$ $P = 4 \times 11 = 44\text{m}$

12. Determine the total surface area of each composite object.

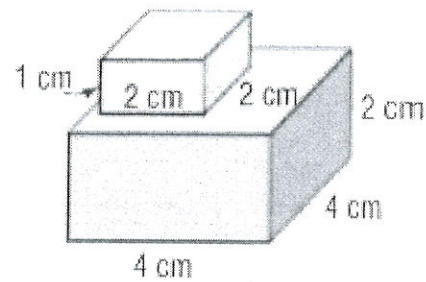


$$\begin{aligned} \text{Overlap} \\ 2\pi r^2 \\ = (2)(\pi)(0.5)^2 \\ = 1.57 \end{aligned}$$

$$\begin{aligned} \textcircled{1} \quad 2\pi r^2 + 2\pi rh \\ = (2)(\pi)(2)(2) + (2)(\pi)(2)(1.5) \\ = 25.12 + 18.84 \\ = 43.96 \end{aligned}$$

$$\begin{aligned} \textcircled{2} \quad (2)(\pi)(0.5)(0.5) + (2)(\pi)(0.5)(4.5) \\ = 1.57 + 14.13 \\ = 15.70 \end{aligned}$$

$$TSA = 43.96 + 15.7 - 1.57 = 58.09$$



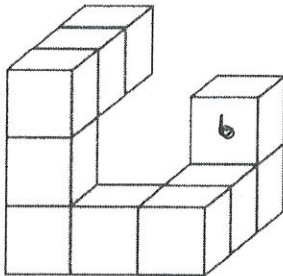
$$\begin{aligned} \text{Overlap} \\ 2 \times 2 = 4 \\ \times 2 \\ \hline 8 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Top} \\ 1 \times 2 = 2 \\ 1 \times 2 = 2 \\ 2 \times 2 = 4 \\ \hline 8 \\ \times 2 \\ \hline 16 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Bottom} \\ 2 \times 4 = 8 \\ 2 \times 4 = 8 \\ 4 \times 4 = 16 \\ \hline 32 \\ \times 2 \\ \hline 64 \text{ cm}^2 \end{aligned}$$

$$\begin{array}{r} \text{TSA} \\ \hline 16 \\ + 64 \\ \hline - 8 \\ \hline 72 \end{array}$$

13. If one face is 2 cm^2 , then find the total surface area of the shape below and on the left.



* 10 Blocks with 18 overlap sides

$$10 \times 6 = 60 \times 2 \text{ cm}^2 = 120 \text{ cm}^2$$

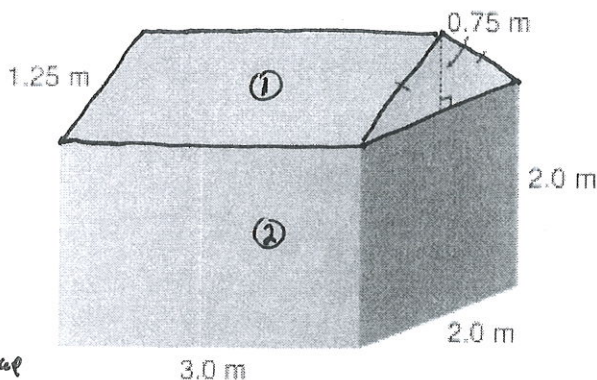
$$18 \times 2 \text{ cm}^2 = 36 \text{ cm}^2 \text{ overlap}$$

$$120 - 36 = 84 \text{ cm}^2$$

b. How does the total surface area change if you remove the top block on the right? (marked with b)
object in (a) will lose 5 faces and 2 overlap, but then gain one side

$$\text{Result} \rightarrow 60 - 5 \times 2 = 50 \text{ blocks with 16 overlaps } (108 - 32 = 76 \text{ cm}^2)$$

14. Find the total exterior surface area of the house shown below and on the right.



$$\textcircled{1} \quad \Delta A = \frac{bh}{2} = \frac{(3)(0.75)}{2} = 0.75 \times 2 = 1.5 \text{ m}^2$$

$$\square A = bh = (1.25)(3) = 3.75 \times 2 = 7.5 \text{ m}^2$$

$$\text{Total is } 9 \text{ m}^2$$

$$\textcircled{2} \quad \square A = bh = (3)(2) = 6 \times 2 = 12 \text{ cm}^2$$

$$\square A = bh = (2)(2) = 4 \times 2 = 8 \text{ cm}^2$$

$$\text{Total is } 20 \text{ cm}^2$$

Overlap
* NOTE: $\textcircled{1}$ has no bottom (6).

$\textcircled{2}$ has Top or Bottom (6+6=12)

18

$$TSA = 20 + 9 = 29 \text{ cm}^2$$

CHAPTER TWO: POWERS AND EXPONENT LAWS

1. Does 5^2 and 2^5 mean the same thing? No. $5^2 = 5 \times 5$, $2^5 = 2 \times 2 \times 2 \times 2 \times 2$

2. Complete this table.

Power	Base	Exponent	Repeated Multiplication	Standard Form
4^2	4	2	$(4)(4)$	16
$-(-10)^5$	-10	5	$(-1)(-10)(-10)(-10)(-10)(-10)$	100000
$(-6)^2$	-6	2	$(-6)(-6)$	36
1^5	1	5	$1 \times 1 \times 1 \times 1 \times 1$	1
$(-2)^3$	-2	3	$(-2)(-2)(-2)$	-8
3^6	3	6	$3 \times 3 \times 3 \times 3 \times 3 \times 3$	729
-8^3	8	3	$-(8 \times 8 \times 8)$ or $(-1)(8)(8)(8)$	-512
5^3	5	3	$(5)(5)(5)$	125
-3^4	3	4	$(-1)(3)(3)(3)(3)$	-81
$(-1)^{11}$	-1	11	$(-1)(-1)(-1)(-1)(-1)(-1)(-1)(-1)(-1)(-1)(-1)$	-1

3. Evaluate each power. a) $4^0 = 1$ b) $-23^0 = -1$ c) $(-6)^0 = 1$

4. Evaluate.

a) $5 - 3^2 = -4$ b) $(5 + 3)^2 = 8^2 = 64$ c) $5^2 + 3^2 = 25 + 9 = 34$ d) $4^3 \times 2^3 = 64 \times 8 = 512$ e) $-8^2 \div (-2)^3 = -64 \div -8 = 8$

5. Evaluate.

a) $(18 \div 3^2 + 1)^4 - 4 = (3)^4 - 4 = 81 - 4 = 77$ b) $3^3 \div 9(3^0 - 2^2) = 27 \div 9(1 - 4) = 27 \div 9(-3) = 27 \div (-27) = -1$ c) $(12^2 + 5^3)^0 - 2[(-3)^3] = 1 - 2(-27) = 1 - (-54) = 55$

6. Find the mistake, circle it, and write the correct solution.

$(7 - 5)^3 \times (8 + 2)^4 = (2)^3 \times (10)^4 = \underline{6} \times 10000 = 60000$
 $8 \times 10000 = 80000$

7. Write each product as a single power.

a) $4^3 \times 4^2 = 4^5$ b) $(-2)^2 \times (-2)^4 = (-2)^6$ c) $(-7) \times (-7)^2 = (-7)^3$

8. Write each quotient as a single power.

a) $8^7 \div 8^5 = 8^2$

b) $10^4 \div 10^0 = 10^4$

c) $\frac{(-9)^{10}}{(-9)^4} = (-9)^6$

9. Express as a single power.

a) $2^3 \times 2^6 \div 2^9 = 2^0$

b) $\left[\frac{(-5)^4}{(-5)}\right]^4 = (-5)^{12}$
 $\frac{(-5)^{16}}{(-5)^4} \rightarrow$

c) $\frac{6^3 \times 6^5}{6^2 \times 6^4} = \frac{6^8}{6^6} = 6^2$

10. Evaluate.

a) $4^3 \div 4^2 + 2^4 \times 3^2$
 $= 4^1 + 2^4 \times 3^2$
 $= 4 + 16 \times 9$
 $= 148$

b) $(-2)^6 \div (-2)^5 - (-2)^5 \div (-2)^3$
 $\frac{(-2)^1}{(-2)} - \frac{(-2)^2}{(-2)^2}$
 $(-2) - (+1)$
 $= -3$

c) $\frac{3^4}{3^3} + \frac{4^2 \times 4^0}{2^4}$
 $3^1 + \frac{4^2}{2^4} = 3 + \frac{16}{16} = 3 + 1 = 4$

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

a) $[(-4) \times 3]^2$
 $(-4)^2 \times 3^2$

b) $(10 \div 5)^3$
 $10^3 \div 5^3$

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

d) $\left(\frac{2^6}{4^3}\right)^2 = \frac{2^{12}}{4^6}$

12. Write as a single power.

a) $(3^4)^2 = 3^8$

b) $-(7^2)^2 = -(7^4)$

c) $[(-3)^3]^2 = (-3)^6$

13. Simplify, then evaluate

a) $4^0 + 4$
 $1 + 4$
 5

b) $(5^4 \div 5^2)^2$
 $= (5^2)^2$
 $= 5^4$
 $= 625$

c) $[(-3)^0 \times (-3)^3]^2$
 $((-3)^3)^2$
 $(-3)^6$
 729

d) $(10^2)^4 \div (10^3)^2$
 $10^8 \div 10^6$
 10^2
 100

14. Simplify, then evaluate each expression

a) $(3^2 \times 4^3)^2 - (4^4 \div 4^2)^2$
 $(9 \times 64)^2 - (4^2)^2$
 $576^2 - 4^4$
 $331776 - 256$
 331520

b) $(2^3 \div 2^2)^3 + (7^4 \times 7^3)^0$
 $2^3 + 1$
 $8 + 1$
 9

c) $[(-1)^3]^4 - [(-1)^4 \div (-1)^3]^2$
 $(-1)^{12} - [(-1)^1]^2$
 $(-1)^{12} - (-1)^2$
 $(+1) - (+1)$
 0

d) $[(-5)^2 \times (-5)]^3 + (2^5 \div 2^3)^3$
 $[(-5)^3]^3 + (2^2)^3$
 $(-5)^9 + 2^6$
 $1953125 + 64$
 1953189

CHAPTER THREE: RATIONAL NUMBERS

1. Evaluate. For questions with fractions, use common denominators.

$$a) 3\frac{1}{6} + (-5\frac{1}{2})$$

$$\frac{19}{6} + (-\frac{11}{2})$$

$$(\frac{38}{12}) + (-\frac{66}{12})$$

$$\frac{-28}{12} = -\frac{7}{3} \text{ or } -2\frac{1}{3}$$

$$b) -2\frac{1}{3} + -5\frac{2}{5}$$

$$-\frac{7}{3} + -\frac{27}{5}$$

$$-\frac{35}{15} + -\frac{81}{15}$$

$$-\frac{116}{15} \text{ or } -7\frac{11}{15}$$

$$c) 3\frac{4}{7} \div -8\frac{1}{6}$$

$$\frac{25}{7} \div -\frac{49}{6}$$

$$\frac{25}{7} \times \frac{-6}{49}$$

$$\frac{150}{343}$$

$$d) -7\frac{1}{4} - (-2\frac{1}{5})$$

$$-\frac{29}{4} - (-\frac{11}{5})$$

$$-\frac{145}{20} - \frac{-44}{20}$$

$$-\frac{101}{20} \text{ or } -5\frac{1}{20}$$

$$e) 3\frac{1}{4} - (-2\frac{2}{3})$$

$$\frac{13}{4} - (-\frac{8}{3})$$

$$\frac{39}{12} - \frac{-32}{12}$$

$$\frac{71}{12} \text{ or } 5\frac{11}{12}$$

$$f) -\frac{3}{4} + 0.7$$

$$(1) -0.75 + 0.7$$

$$\frac{-75}{100} + \frac{70}{100}$$

$$= -0.05$$

$$(2) -\frac{3}{4} + \frac{7}{10}$$

$$-\frac{30}{40} + \frac{28}{40}$$

$$-\frac{2}{40} = -\frac{1}{20}$$

$$g) \left(\frac{10}{7}\right)\left(-\frac{13}{8}\right)$$

$$= \frac{130}{56}$$

$$= 5\frac{5}{14} \text{ or } 1\frac{2}{3}$$

$$h) \left(-4\frac{3}{5}\right)\left(-2\frac{5}{12}\right)$$

$$-\frac{23}{5} \times -\frac{29}{12}$$

$$\frac{667}{60} \text{ or } 11\frac{7}{60}$$

$$i) \frac{-11}{15} \div \frac{-7}{5}$$

$$-\frac{11}{15} \times -\frac{5}{7}$$

$$\frac{55}{105} = \frac{11}{21}$$

2. Evaluate

$$a) -5.8 - 3.1 \times 0.5$$

$$= -5.8 - 1.55$$

$$= -7.35$$

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

$$\frac{3}{8} - \frac{9}{4} \div \left[-\frac{27}{20} \right]$$

$$\frac{3}{8} - \frac{9}{4} \times \frac{-20}{27}$$

$$\frac{3}{8} - \left(\frac{-180}{108} \right)$$

$$\frac{3}{8} - \left(-\frac{5}{3} \right)$$

$$\frac{9}{24} - \left(\frac{-40}{24} \right)$$

$$\frac{49}{24} \text{ or } 2\frac{1}{24}$$

$$c) \frac{1}{2} \div \left[\frac{11}{3} + \frac{-1}{4} \right] \times \frac{3}{2}$$

$$\frac{1}{2} \div \left[\frac{41}{12} \right] \times \frac{3}{2}$$

$$\frac{1}{2} \times \frac{12}{41} \times \frac{3}{2}$$

$$\frac{12}{82} \times \frac{3}{2}$$

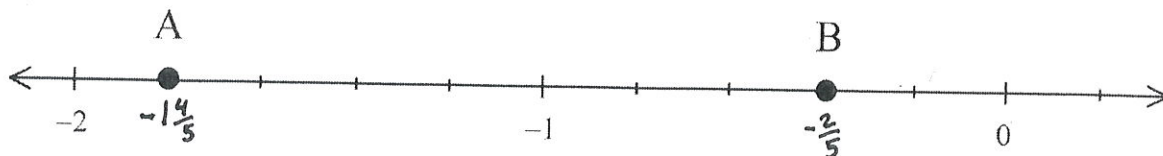
$$\frac{36}{164}$$

$$\frac{9}{41}$$

3. The product of 2 fractions is $-\frac{7}{8}$. If one fraction is $\frac{5}{6}$, what is the other fraction?

$$\frac{5}{6} \times \boxed{} = -\frac{7}{8} \quad \text{so...} \quad -\frac{7}{8} \div \frac{5}{6} = -\frac{7}{8} \times \frac{6}{5} = -\frac{42}{40} = -\frac{21}{20} \leftarrow \text{answer}$$

4. Label each dot as a fraction.



5. Identify a rational number between the following two numbers.

a) -3.6° and -3.7° *add trailing zeroes.*

\uparrow
 -3.65

b) $\frac{-5}{6}$ and $\frac{-6}{7}$

\downarrow
 $\frac{-35}{42}$ $\frac{-36}{42}$ (common denominator)

\downarrow
 $\frac{-350}{420}$ $\frac{-360}{420}$ ($\times 10$)

6. The temperature of the freezer changed from -16.1 degrees to -13.4 . Did the temperature increase or decrease. By how much did the temperature of the freezer change. Use an equation to show. How much does the temperature of the freezer have to change before it reaches -2.9 degrees.

• Increase in temperature • $(-2.1) - (-6.1)$
• $(-13.4) - (-16.1)$ • $= 14^\circ\text{C change needed.}$
• $= +2.7$

7. The lowest point on land in North America is Death Valley at 86 m below sea level. The highest point is the peak of Mt. McKinley at 6279.7 m above sea level. Calculate the distance between them.

$(+6279.7) - (-86) = 6365.7 \text{ meters}$

8. A weird restaurant puts the prices of its items on the menu in fraction form. A veggie burger cost $11\frac{3}{4}$. On Saturday's the price was $\frac{1}{2}$ off. What was the price of the veggie burger on that day. Solve the problem first using fractions

$\frac{1}{2} \times 11\frac{3}{4}$

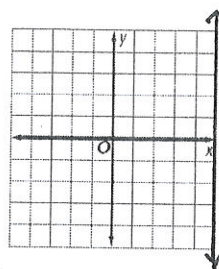
$\frac{1}{2} \times \frac{47}{4}$

$\frac{47}{8}$ or $5\frac{7}{8}$

CHAPTER 4: LINEAR RELATIONS

1. Graph $x = 5$. Describe the graph.

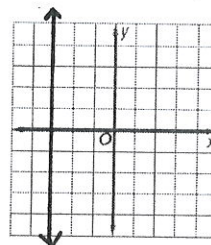
Vertical Line through 5 on x-axis



2. Graph $4x = -12$. Describe the graph.

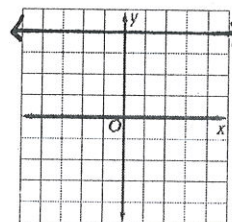
$$x = -3$$

Vertical Line through -3 of x-axis



3. Graph $y = 4$. Describe the graph.

Horizontal Line through 4 of y-axis



4. Graph $2y + 6 = 0$. Describe the graph.

$$2y + 6 = 0$$

$$2y + 6 - 6 = 0 - 6$$

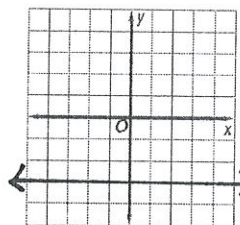
$$2y = -6$$

$$y = -3$$

Vertical Line

through -3

of y-axis



5. Graph $4x + y = 5$ for values $x = -2, 0$, and 2

X	Y
-2	13
0	5
2	-3

$$4x + y = 5$$

$$4(-2) + y = 5$$

$$-8 + y = 5$$

$$-8 + y + 8 = 5 + 8$$

$$y = 13$$

$$4x + y = 5$$

$$4(0) + y = 5$$

$$0 + y = 5$$

$$y = 5$$

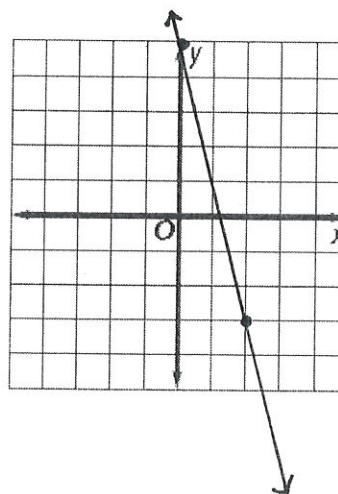
$$4x + y = 5$$

$$4(2) + y = 5$$

$$8 + y = 5$$

$$8 + y - 8 = 5 - 8$$

$$y = -3$$



6. Explain if each table represents a linear relation.

	X	Y
-1	9	6
-1	8	13
-1	7	20
-1	6	27
-1	5	34

YES

	X	Y
4	1	6
4	5	11
4	9	16
4	13	23
4	17	31

NO

7. Rachel has a blockbuster rewards membership. It costs \$20 a year for the membership and each movie she rents costs her \$4.80.

a) Create a table that shows the cost for Rachel when she rents up to 5 movies.

n	0	1	2	3	4	5
C	20	24.80	29.60	34.40	39.20	44.00

b) Identify the independent and dependent variables.

I.V.: # movies

D.V.: Cost

c) Write an equation that relates the cost, C, to the # of movies, n, that Rachel rents.

$$C = 4.8n + 20$$

d) What will the charge be when if she rents 14 movies?

$$C = 4.8n + 20 = 4.8(14) + 20 = 67.20 + 20 = \$87.20$$

e) How many movies did she rent if she spent \$130.40?

$$130.40 = 4.8n + 20$$

$$110.40 = 4.8n$$

$$23 = n$$

23 movies

8 Make an equation for the linear relation shown in the table. Using the equation, what is the value of y when x = 8?

x	0	1	2	3
y	8	11	14	17

3 3 3

$$y = 3x + 8$$

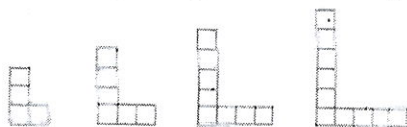
$$y = 3x + 8$$

$$y = 3(8) + 8$$

$$y = 24 + 8$$

$$y = 32$$

9. While tiling his bathroom floor, Sam takes a break decides to make patterns with some tiles. Use this pattern to answer the questions regarding the relationship between the number of tiles, (t) and the diagram number, (d)?



A) Create a table of values to explain how the number of tiles is related to the diagram number.

d	1	2	3	4
t	4	6	8	10

B) Write an equation that relates the number of tiles used in terms of the diagram number.

$$t = 2d + 2$$

C) Identify the dependent and independent variables.

↳ diagram # ↳ # tiles

D) Is this data continuous or discrete? Explain.

Discrete. No 1.5 diagram

E) Write an equation that relates the number of tiles used in terms of the diagram number

see (B)

F) If Sam used 42 tiles, what diagram number would that be?

$$42 = 2d + 2 \rightarrow 40 = 2d \rightarrow 20 = d$$

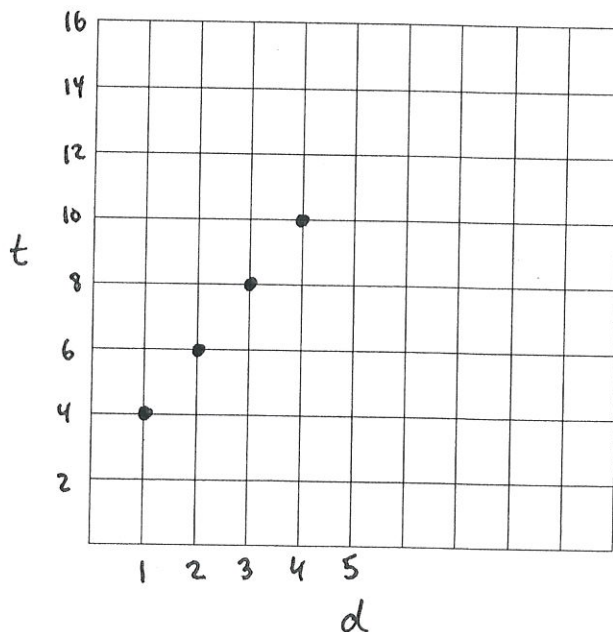
G) If Sam made 15 diagrams with his tiles, how many tiles would be in that fifteenth diagram?

$$t = 2(15) + 2$$

$$t = 30 + 2$$

$$t = 32$$

H) Graph the data in the table. Label the axes.



I) Does this data represent a linear relation? Explain.

yes, Linear since it is straight.

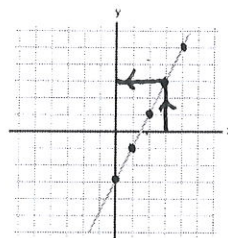
10. Which equation would create the following table of values?

- a) $y = 4.50x + 100$
 b) $y = 4.50x - 100$
 c) $y = 100 - 4.50x$
 d) $y = 100 + 4.50x$

x	y
0	100
1	95.5
2	91
3	86.5
4	82

11. For the graph below, what is y when $x = 3$? Is this interpolation or extrapolation?

$y = 3$
 Interpolation



Which equation matches the graph?

- $y = 2x + 1$
 $y = 2x - 3$
 $y = -4 + 2x$
 $y = 9 - 3x$

make table

x	y
2	1
3	3
4	5

12. Match each equation with a graph on this grid. Show all workings.

B

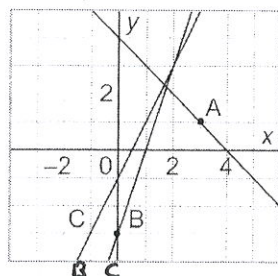
A

C

Equation #1: $y = 2x - 1$

Equation #2: $y = -x + 4$

Equation #3: $y = 3x - 3$



Line A ... use (3, 1)

Equation 2

$$y = -x + 4$$

$$1 = -(3) + 4$$

$$1 = -3 + 4$$

$$1 = 1$$

Line B ... use (1, 1)

Equation #1

$$y = 2x - 1$$

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

$$1 = 2 - 1$$

$$1 = 1$$

Line C ... use (0, -3)

Equation #3

$$y = 3x - 3$$

$$-3 = 3(0) - 3$$

$$-3 = 0 - 3$$

$$-3 = -3$$