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ID: B

First Name: _____

Last Name: _____

Math 10C – Practice Final Exam

Competency #C3 – Connect numbers to real-life problems. _____ / 5 marks

Competency #C4 – Communicate ideas effectively using graphs. _____ / 6 marks

Competency #C2 – Use algebra to solve real-life problems. _____ / 13 marks

Competency #C6 – Use tools and estimation to determine measurement _____ / 6 marks

Competency #C7 – Use trigonometry to solve real-life problems _____ / 4 marks



Competency 3 – Connect numbers to real-life problems. 5 POINTS

- 2 1. Write $3xy^2\sqrt{2x}$ as an entire radical. (2 marks)

$$\sqrt{(3xy^2)^2} \cdot \sqrt{2x}$$

$$\sqrt{9x^2y^4} \cdot \sqrt{2x}$$

$$\boxed{\sqrt{18x^3y^4}}$$

- 3 2. Simplify with positive exponents. (3 marks)

$$\frac{(x^5y^{-2}z^{\frac{1}{2}})^3}{[(x^{\frac{2}{3}}y^{-1})^2(z)]^5} = \frac{x^{15}y^{-6}z^{\frac{3}{2}}}{[x^{\frac{4}{3}}y^{-2}z]^5} = \frac{x^{15}y^{-6}z^{\frac{3}{2}}}{x^{\frac{20}{3}}y^{-10}z^5}$$

$$\frac{x^{15}z^{\frac{3}{2}}y^{10}}{x^{\frac{20}{3}}z^5y^6}$$

$$15 - \frac{20}{3} = \frac{25}{3}$$

$$\frac{3}{2} - 5 = -\frac{7}{2}$$

$$x^{\frac{25}{3}}y^4z^{-\frac{7}{2}}$$

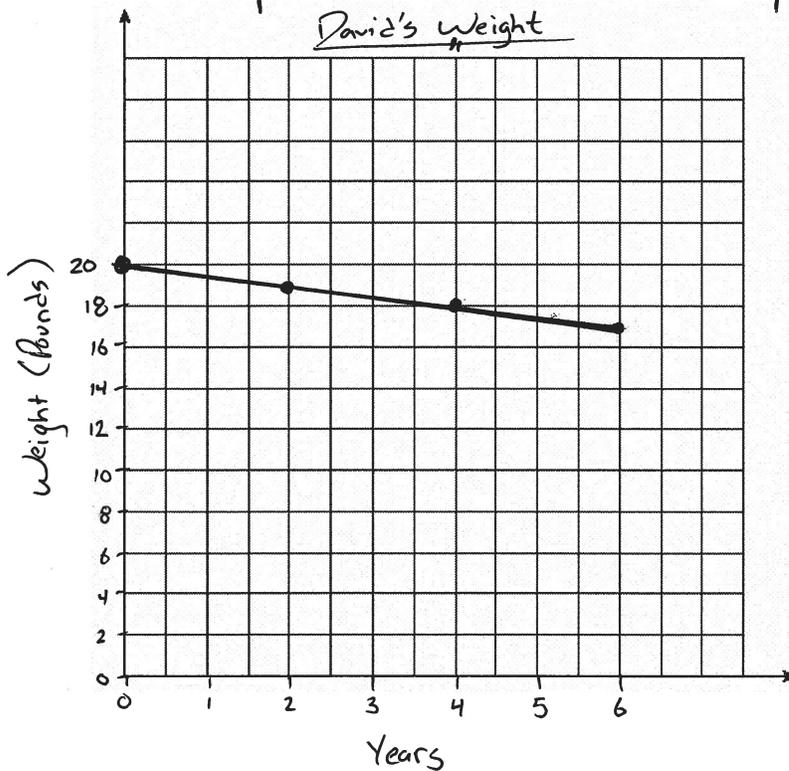
$$= \boxed{\frac{x^{\frac{25}{3}}y^4}{z^{\frac{7}{2}}}}$$

Competency 4 – Communicate ideas effectively using graphs. 6 POINTS

3. Mr. Bayer's cat David is getting old. He was originally 20 lbs when he moved to Alberta, and has since lost 0.5lbs per year. He has lived in Alberta for 6 years. (6 points)

a) Sketch a graph of David's weight versus time to represent David's weight over the last 6 years, where w represents David's weight, in pounds, and t represents time, in years. (2 points)

2



b) State the dependent and independent variables. (1 point)

Independent → Time (t)

Dependant → weight (w)

c) Determine the range using Set Notation. (1 point)

↳ y-values

$$\{w \mid 17 \leq w \leq 20, w \in \mathbb{R}\}$$

d) What does the w -intercept represent (1 point)

Starting weight.

e) Determine the domain using Interval Notation. (1 point)

$$[0, 6]$$

Competency 2 – Use algebra to solve real-life problems. 13 POINTS

4. Factor the following equations. (2 marks)

a) $x^2 + x - 12$

$$\begin{matrix} 4 \\ \square \end{matrix} + \begin{matrix} -3 \\ \square \end{matrix} = 1$$

$$\square \times \square = -12$$

$$(x+4)(x-3)$$

b) $x^2 + 4x - 12$

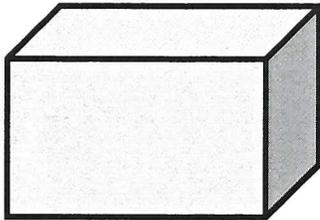
$$\begin{matrix} 6 \\ \square \end{matrix} + \begin{matrix} -2 \\ \square \end{matrix} = 4$$

$$\square \times \square = -12$$

$$(x+6)(x-2)$$

5. Below is a three-dimensional box with a **volume** of $2x^3 + 5x^2 + 2x$. (3 marks)

Note: None of the side lengths are 1 unit.



$$\begin{aligned} &2x^3 + 5x^2 + 2x \\ &\times (2x^2 + 5x + 2) \\ &\times [2x^2 + 1x + 4 | x + 2] \\ &\times [x(2x+1) + 2(2x+1)] \\ &\times (2x+1)(x+2) \end{aligned}$$

$$\begin{matrix} 1 \\ \square \end{matrix} + \begin{matrix} 4 \\ \square \end{matrix} = 5$$

$$\square \times \square = 4$$

1/ a) Write expressions for the dimensions of the box by fully factoring the volume.

$$\text{Vol} = (x)(2x+1)(x+2)$$

1/ b) If $x = 8\text{cm}$, what is the length of the shortest of the three sides?

$$\text{Shortest side} = x$$

$$\text{Shortest side} = 8\text{cm}$$

1/ c) If $x = 8\text{cm}$, what is the volume of the box?

$$\begin{aligned} \text{Vol} &= (8)(16+1)(8+2) \\ &= (8)(17)(10) \\ &= 1360\text{cm}^3 \end{aligned}$$

3

6. Use the data table below to write an equation in the form $y=mx+b$. (3 marks)

x	y
15	100
18	90
21	80

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{90 - 100}{18 - 15} = \frac{-10}{3}$$

$$\text{So } y = -\frac{10}{3}x + b$$

Use (15, 100) to find b.

$$100 = -\frac{10}{3}(15) + b$$

$$100 = -50 + b$$

$$150 = b$$

$$y = -\frac{10}{3}x + 150$$

7. Arming for the zombie apocalypse, Bill and Ted purchase weapons.

- Bill buys 3 hatchets and 5 shovels for \$81.75
- Ted buys 1 hatchet and 3 shovels for \$38.25

5

What are the prices of hatchets and shovels? (5 marks)

Let h = hatchet
 s = shovel

$$3h + 5s = 81.75$$

$$1h + 3s = 38.25$$

$$\xrightarrow{\text{Times 3}} \begin{array}{r} 3h + 5s = 81.75 \\ -(3h + 9s = 114.75) \\ \hline -4s = -33 \end{array}$$

$$-4s = -33$$

$$s = 8.25$$

← Plug back in

$$1h + 3(8.25) = 38.25$$

$$1h + 24.75 = 38.25$$

$$1h = 13.50$$

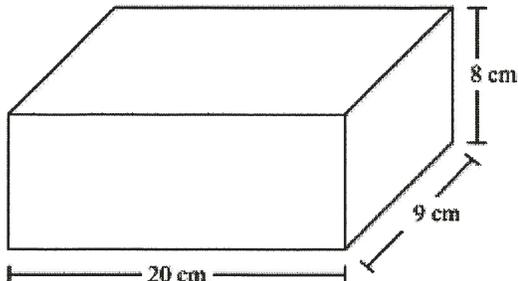
So hatchet's cost \$13.50, and shovels cost \$8.25.

Competency 6 – Use tools and estimation to determine measurement. 6 POINTS

8. Calculate the Volume and Surface Area for each shape. Convert to inch² or inch³ when you are done.

3

a) The rectangular prism (3 marks)



VOLUME

$$\begin{aligned} \text{Vol} &= L \times W \times H \\ &= (20)(9)(8) \\ &= 1440 \text{ cm}^3 \end{aligned}$$

CONVERSIONS

$$\text{SA: } \frac{824 \text{ cm}^2}{1} \times \frac{1 \text{ in}}{2.54 \text{ cm}} \times \frac{1 \text{ in}}{2.54 \text{ cm}} = \boxed{127.7 \text{ in}^2}$$

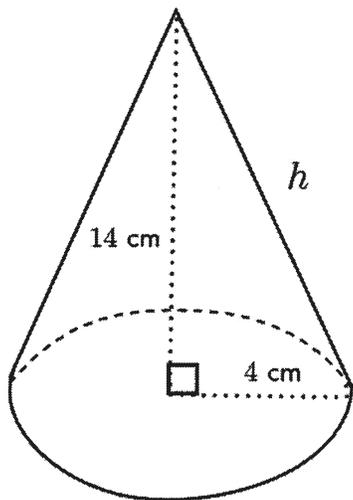
$$\text{Vol: } \frac{1440 \text{ cm}^3}{1} \times \frac{1 \text{ in}}{2.54 \text{ cm}} \times \frac{1 \text{ in}}{2.54 \text{ cm}} \times \frac{1 \text{ in}}{2.54 \text{ cm}} = \boxed{87.9 \text{ in}^3}$$

SURFACE AREA

$$\begin{aligned} \text{Top} &= 20 \times 9 = 180 \\ \text{Bottom} &= 180 \\ \text{Front} &= 20 \times 8 = 160 \\ \text{Back} &= 160 \\ \text{Right} &= 9 \times 8 = 72 \\ \text{Left} &= 72 \\ \hline &= 824 \text{ cm}^2 \end{aligned}$$

3

b) The cone (3 marks)



$$\begin{aligned} a^2 + b^2 &= c^2 \\ 4^2 + 14^2 &= c^2 \\ c &= 14.56 \text{ cm} \end{aligned}$$

VOLUME

$$\begin{aligned} \text{Vol} &= \frac{\pi r^2 h}{3} \\ &= \pi (4)^2 (14) \\ &= 703.72 \text{ cm}^3 \end{aligned}$$

CONVERSIONS

$$\text{SA: } \frac{233.23 \text{ cm}^2}{1} \times \frac{1 \text{ in}}{2.54 \text{ cm}} \times \frac{1 \text{ in}}{2.54 \text{ cm}} = \boxed{36.2 \text{ in}^2}$$

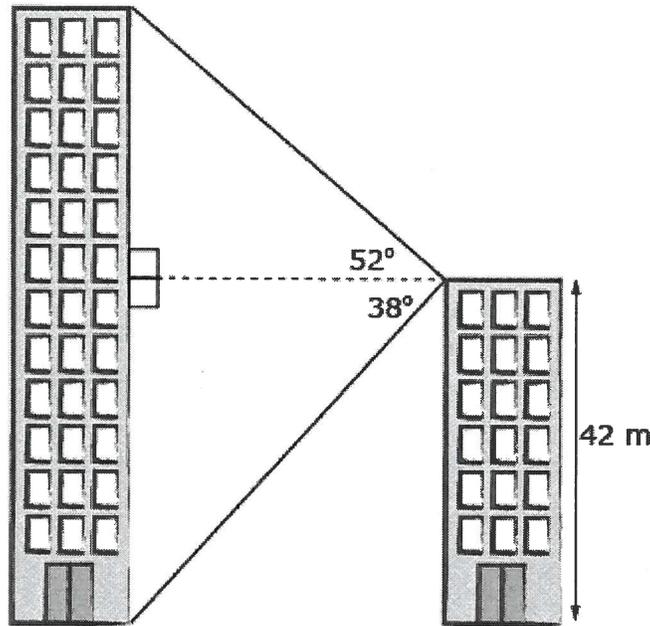
$$\text{Vol: } 703.72 \text{ cm}^3 \times \frac{1 \text{ in}}{2.54 \text{ cm}} \times \frac{1 \text{ in}}{2.54 \text{ cm}} \times \frac{1 \text{ in}}{2.54 \text{ cm}} = \boxed{42.9 \text{ in}^3}$$

SURFACE AREA

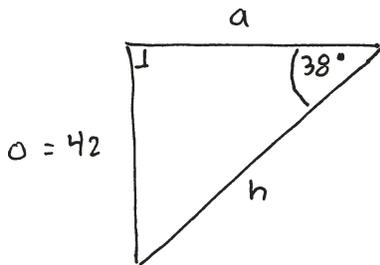
$$\begin{aligned} \text{SA} &= \pi r^2 + \pi r s \\ &= \pi (4)^2 + \pi (4)(14.56) \\ &\approx 50.265 + 182.966 \\ &= 233.23 \text{ cm}^2 \end{aligned}$$

Competency 7 – Use trigonometry to solve real-life problems. 4 POINTS

Two buildings are depicted below.



9. A) How far apart are the two buildings? Express your answer to the nearest tenth of a meter (1 mark)



$$\tan \theta = \frac{o}{a}$$

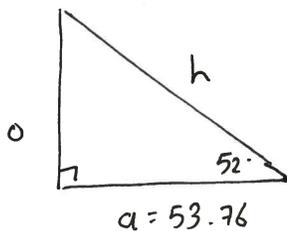
$$\tan 38^\circ = \frac{42}{a}$$

$$a = \frac{42}{\tan 38^\circ}$$

$$a = \frac{42}{0.78128\dots}$$

$$a = 53.76 \text{ m}$$

- b) What is the height of the tallest building? Express your answer to the nearest tenth of a meter. (3 marks)

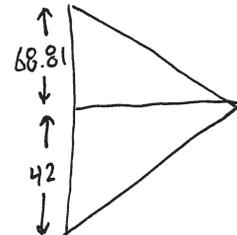


$$\tan \theta = \frac{o}{a}$$

$$\tan 52^\circ = \frac{o}{53.76}$$

$$1.2799 = \frac{o}{53.76}$$

$$o = 68.81 \text{ m}$$



$$\text{Height} = 110.8 \text{ m}$$