NAME: - KEY -

LAMBRICK PARK SECONDARY SCHOOL

## Foundations of Mathematics and Pre-Calculus 10

PRACTICE FINAL EXAM

Jan. 2020

Instructions

1. When using your calculator (scientific or approved graphing calculator):
   - use the programmed value of π rather than the approximation of 3.14.
   - round only in the final step of the solution.
   - ensure that your calculator is set to DEGREE mode

2. Diagrams are not necessarily drawn to scale.

1. What is the **slope** of the following line?
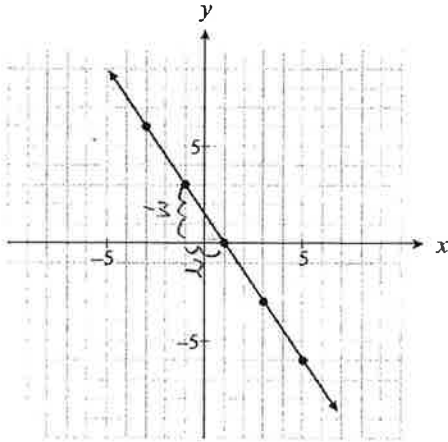
Slope = $m = \dfrac{-3}{2}$

$y = mx + b$

2. What is the equation of the line passing through $(-1, 10)$ and $(2, -2)$ in **slope – intercept** form?

$x_1 \ y_1 \qquad x_2 \ y_2$

$m = \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{-2 - 10}{2 - (-1)} = \dfrac{-12}{3} = -4$

$y - y_1 = m(x - x_1)$

$y - 10 = -4(x - (-1))$

$y - 10 = -4(x + 1)$

$y - 10 = -4x - 4$

$\underline{+10 \qquad\qquad +10}$

$\boxed{y = -4x + 6}$

3. If $f(x) = 5x + 6$, determine $f(-3)$.

$f(-3) = 5(-3) + 6$

$\qquad = -15 + 6$

$\boxed{f(-3) = -9}$

4. What is the Greatest Common Factor of 72, 56, and 40?

72
$\wedge$
② 36
   $\wedge$
   ② 18
      $\wedge$
      ② 9
         $\wedge$
         ③ ③

$= 2^3 \cdot 3^2$

56
$\wedge$
2 28
   $\wedge$
   2 14
      $\wedge$
      2 7

$= 2^3 \cdot 7$

40
$\wedge$
2 20
   $\wedge$
   2 10
      $\wedge$
      2 5

$= 2^3 \cdot 5$
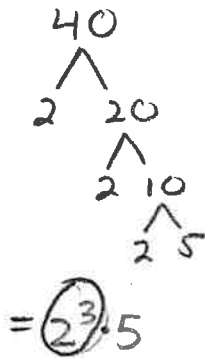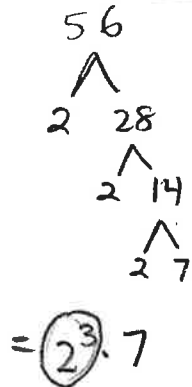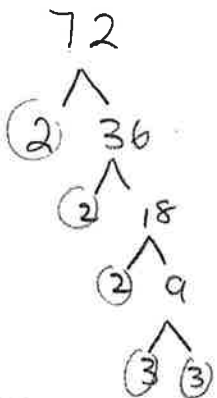
common primes in all lists

$GCF = 2^3 = \boxed{8}$

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5. Which of the following numbers are **Irrational**? $-\sqrt{16}$, π, $\sqrt[3]{64}$, $\sqrt{28}$, $-3.3333\ldots$, $\sqrt[3]{4}$

$-\sqrt{16}$
$=-4$
Rational

π
(Irrational)

$\sqrt[3]{64}$
$=4$
Rational

$\sqrt{28}$
(Irrational)

$-3.\overline{3}$
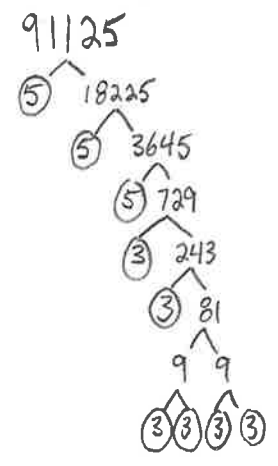repeating decimal
Rational

$\sqrt[3]{4}$
(Irrational)

6. Simplify: $3\sqrt{50}$

$= 3\sqrt{25 \cdot 2}$ ← 25 is biggest perfect square factor of 50!

$= 3\sqrt{25} \cdot \sqrt{2}$

$= 3 \cdot 5\sqrt{2}$

$= 15\sqrt{2}$

ex.
$4^{\frac{3}{2}}$ ✿ – power
灬 – root

$= \left(\sqrt[2]{4}\right)^3 = (2)^3 = 8$

7. Simplify: $(-27x)^{\frac{2}{3}}$

$= (-27)^{\frac{2}{3}} x^{\frac{2}{3}}$

$= \left(\sqrt[3]{-27}\right)^2 x^{\frac{2}{3}}$

$= (-3)^2 x^{\frac{2}{3}} = 9x^{\frac{2}{3}}$

8. Factor: $16p^2 - 81q^2$ ← difference of squares
$a^2 - b^2$
$= (a+b)(a-b)$

$= (4p + 9q)(4p - 9q)$

9. Determine the cube root, using the **grouping method**: $\sqrt[3]{91125}$
(2 marks)

$91125 = 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 5 \cdot 5 \cdot 5$

$91125 = (3 \cdot 3 \cdot 5)(3 \cdot 3 \cdot 5)(3 \cdot 3 \cdot 5)$

$91125 = (45)(45)(45)$

$\therefore \sqrt[3]{91125} = 45$

91125
⑤ 18225
  ⑤ 3645
    ⑤ 729
      ③ 243
        ③ 81
          9 9
        ③③③③

10. Write as a mixed radial in its simplest form: $\sqrt{192}$
(2 marks)

perfect square
factors of 192

$4, 16, \textcircled{64}$
↑ choose biggest one!

$\sqrt{192} = \sqrt{64 \cdot 3}$

$= \sqrt{64} \cdot \sqrt{3}$

$= 8\sqrt{3}$

11. What is the slope and the y-intercept of the following? $3x - 4y + 4 = 0$

change to $y = mx + b$

$3x - 4y + 4 = 0$
$-3x \qquad -4 \quad -3x - 4$

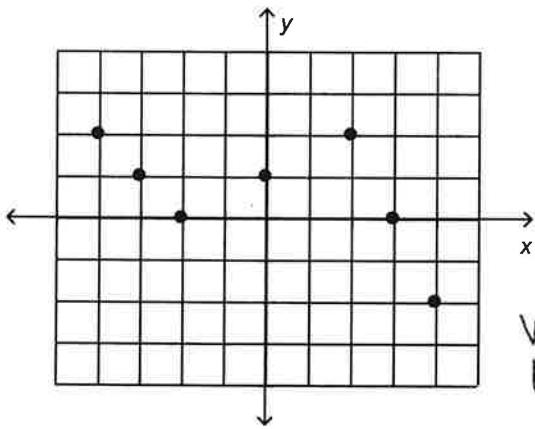$\dfrac{-4y}{-4} = \dfrac{-3x}{-4} - \dfrac{4}{-4}$

$y = \dfrac{3}{4}x + 1$

Slope: $\dfrac{3}{4}$

y-intercept $\quad 1$

12. Are the following relations also **functions**?

A)

B)
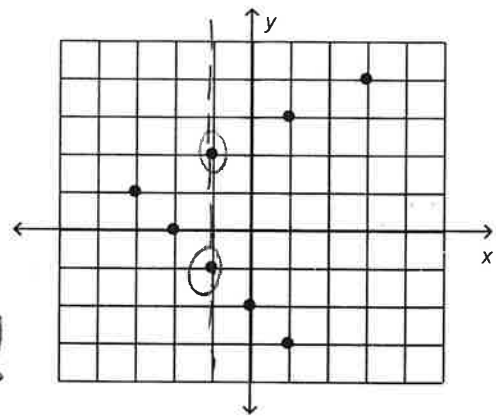

vertical
line test!

Function Y̶ N

Function Y / N̶

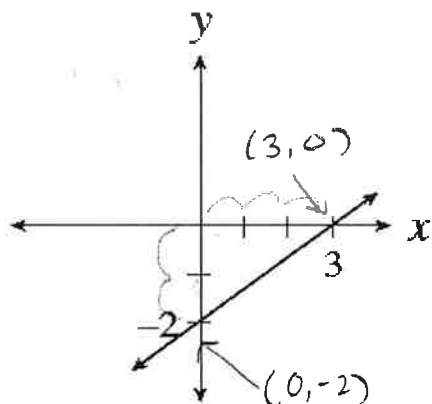13. A line segment has endpoints $A(-7, 3)$ and $B(8, -2)$. Determine the **slope** of AB.

$\quad x_1 \ y_1 \qquad x_2 \ y_2$

$m = \dfrac{y_2 - y_1}{x_2 - x_1}$

$= \dfrac{-2 - 3}{8 - (-7)} = \dfrac{-5}{8 + 7} = \dfrac{-5}{15} = \dfrac{-1}{3}$

SLOPE of AB: $\quad m = \dfrac{-1}{3}$

14. What is the equation of the line below, in **STANDARD FORM?**

$m = \dfrac{2}{3}$

$y - y_1 = m(x - x_1)$

$y - 0 = \dfrac{2}{3}(x - 3)$

$\left(y = \dfrac{2}{3}x - 2\right) \times 3$

$3y = 2x - 6$

$+6 \ -3y \qquad -3y + 6$

$6 = 2x - 3y \rightarrow \boxed{2x - 3y = 6}$

Points on graph: $(3, 0)$, $(0, -2)$

15. The slope of a line segment joining $M(-6, 3)$ and $N(4, k)$ is $\dfrac{3}{5}$. Determine the value of k.

$x_1 \ y_1 \qquad x_2 \ y_2$

$m = \dfrac{y_2 - y_1}{x_2 - x_1}$

$\rightarrow \dfrac{k - 3}{4 - (-6)} = \dfrac{3}{5}$

$\dfrac{k - 3}{4 + 6} = \dfrac{3}{5}$

$\dfrac{k - 3}{10} = \dfrac{3}{5}$ cross multiply

$5(k - 3) = 3 \cdot 10$

$5k - 15 = 30$

$\quad +15 \quad\ +15$

$\dfrac{5k}{5} = \dfrac{45}{5}$

$\boxed{k = 9}$

$k = \underline{\ \ 9\ \ }$

16. Determine an equation of the line passing through the point $(9, -3)$ and parallel to the line segment joining $A(4, 7) \ and \ B(1, 5)$, in **slope – intercept** form.

$x_1 \ y_1 \qquad x_2 \ y_2 \qquad y = mx + b$

x_1, y_1 ← use this point in the equation of a line.

same slope

$m = \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{5 - 7}{1 - 4} = \dfrac{-2}{-3} = \dfrac{2}{3}$

$y - y_1 = m(x - x_1)$

$y - (-3) = \dfrac{2}{3}(x - 9)$

$y + 3 = \dfrac{2}{3}x - \dfrac{18}{3}$

$y + 3 = \dfrac{2}{3}x - 6 \rightarrow \boxed{y = \dfrac{2}{3}x - 9}$

$\ -3 \qquad\qquad -3$

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17. Line AB passes through $(9, 3)$ *and* $(-4, 7)$. Line CD passes through $(4, -3)$ *and* $(8, 10)$. Are these lines **parallel, perpendicular, or neither**?

x_1 y_1 x_2 y_2 x_1 y_1 x_2 y_2

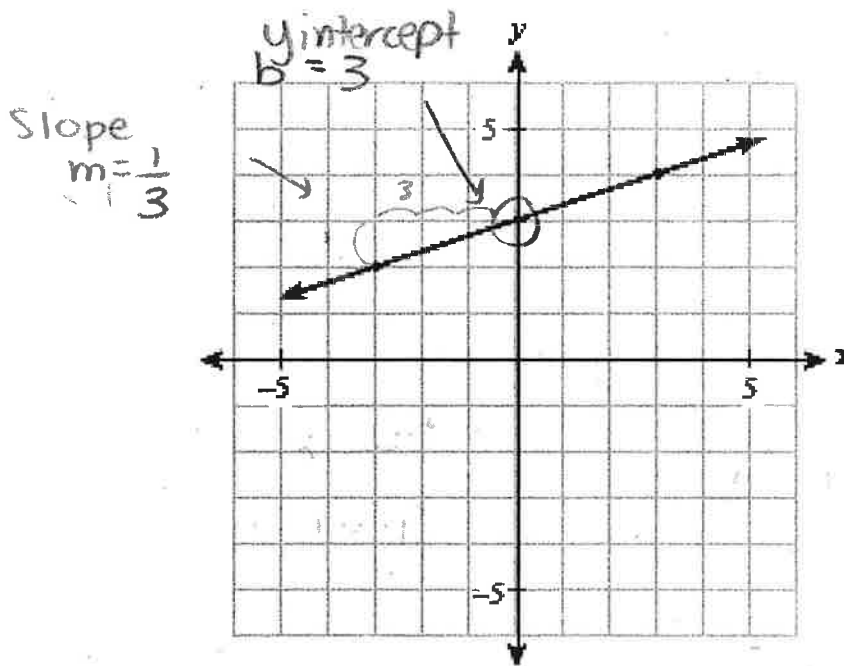same slope ↓   negative reciprocal ↓ (flip and change the sign)

AB:
$$m = \frac{7-3}{-4-9} = \frac{4}{-13} = \frac{-4}{13}$$

→ flip and change sign → $\frac{13}{4}$

CD: $m = \frac{10-(-3)}{8-4} = \frac{10+3}{4} = \frac{13}{4}$

↘ **perpendicular**

18. What is the equation of the line below, in **slope-intercept** form?

y intercept
b = 3

Slope
$m = \frac{1}{3}$
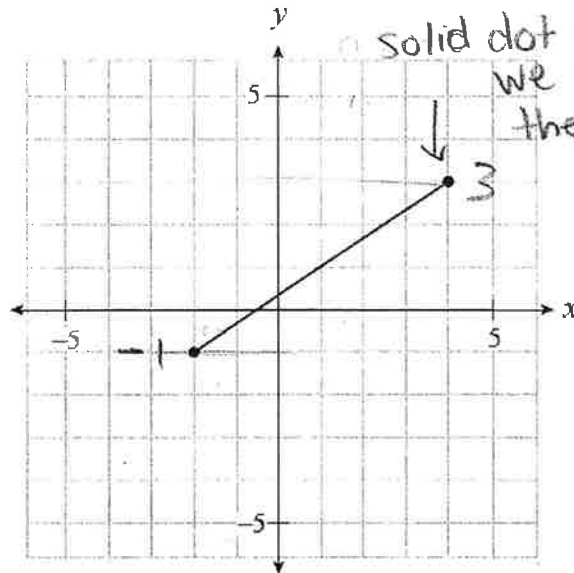

$y = mx + b$

$y = \frac{1}{3}x + 3$

19. Determine the **range** of the following graph.

all possible
y-values

solid dot means
we include
the endpoints

3

-1

Range: $-1 \le y \le 3$

20. Determine the **x-intercept** and **y-intercept** of the graph of $9x + 6y = 72$

set $y=0$

set $x=0$

$9(0) + 6y = 72$

$\dfrac{6y}{6} = \dfrac{72}{6}$

$y = 12$

$(0, 12)$

$9x + 6(0) = 72$

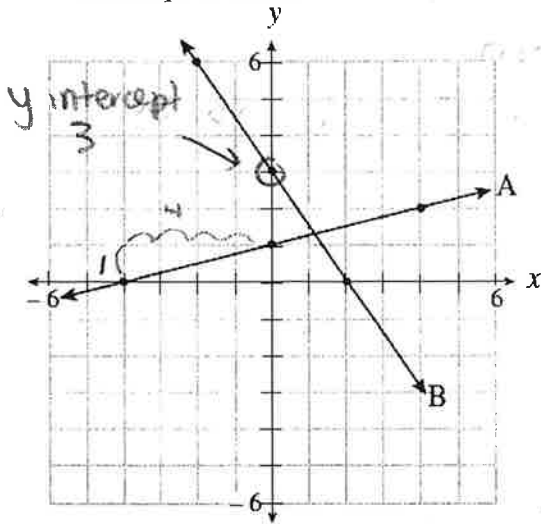$\dfrac{9x}{9} = \dfrac{72}{9}$

$x = 8$

$(8, 0)$

x-intercept: $(8, 0)$

y-intercept: $(0, 12)$

$$Ax + By = C$$

21. Write an equation for a line, in **standard form**, with the same slope as line A and the same y-intercept as line B?

y intercept 3

slope of A | y-intercept of B
$m = \frac{1}{4}$ | $b = 3$

$y = mx + b$

$(y = \frac{1}{4}x + 3) \times 4$ ← to get rid of fractions

$4y = x + 12$ ← put in the proper order

$\underline{-12 \quad\quad -12}$

$4y - 12 = x$
$\underline{-4y \quad\quad -4y}$
$-12 = x - 4y \rightarrow \boxed{x - 4y = -12}$

22. The graph of $y = 4x + k$ has an x-intercept of $(-20, 0)$. Determine the value of k.

$ x y$

$y = 4x + k$

$(0) = 4(-20) + k$ ← plug in x and y

$0 = -80 + k$ ← solve for k

$k = \underline{ 80 }$

$\underline{+80 \quad +80}$

$K = 80$

23. Use the substitution OR elimination method to find the solution to the following linear system:

$$-6x + y = 21 \quad \text{and} \quad x + 9y = 24$$

Substitution:

$-6x + y = 21$

$x + 9y = 24 \rightarrow x = \boxed{-9y + 24}$
$\underline{-9y \quad -9y}$

put into 1st equation for x

$-6(-9y + 24) + y = 21$

$54y - 144 + y = 21$

$55y - 144 = 21$
$\underline{ +144 \quad +144}$

$\dfrac{55y}{55} = \dfrac{165}{55} \rightarrow \boxed{y = 3}$

$x = -9y + 24$

$x = -9(3) + 24$

$x = -27 + 24$

$\boxed{x = -3}$

$\boxed{(-3, 3)}$

Elimination:

$-6x + y = 21$

$(x + 9y = 24) \times 6$

$6x + 54y = 144$

$+(-6x + y = 21)$

$\dfrac{55y}{55} = \dfrac{165}{55}$

$\boxed{y = 3}$

$x + 9(3) = 24$

$x + 27 = 24$
$\underline{ -27 \quad -27}$

$\boxed{x = -3}$

$\boxed{(-3, 3)}$

24. There is a collection of nickels and dimes. The number of dimes is three times the number of nickels. The total value of the collection is \$35.00. How many of each coin are there. Solve using system of equations.

$d = 3x$ n

let n be number of nickels
let d be number of dimes

$$\begin{cases} d = 3n \\ 0.05n + 0.10d = 35.00 \end{cases} \text{ Solve using substitution}$$

↑ how much a nickel is worth   ↑ how much a dime is worth

$0.05n + 0.10(3n) = 35.00$
$0.05n + 0.3n = 35.00$
$\dfrac{0.35n}{0.35} = \dfrac{35.00}{0.35} \rightarrow \boxed{n = 100}$

$d = 3n$
$d = 3(100)$
$\boxed{d = 300}$

There are 100 nickels and 300 dimes

Exponent Rules
$(x^a)^b = x^{a \cdot b}$
$x^a \cdot x^b = x^{a+b}$
$\dfrac{x^a}{x^b} = x^{a-b}$
$\left(\dfrac{x}{y}\right)^{-a} = \left(\dfrac{y}{x}\right)^a$
$(xy)^a = x^a y^a$
$x^{-n} = \dfrac{1}{x^n}$

25. Simplify: $\dfrac{(x^2)^3}{(x^2)(x^{-5})}$

$\dfrac{x^6}{x^{-3}} = x^{6-(-3)} = x^{6+3} = \boxed{x^9}$

26. Simplify: $\left(\dfrac{3x^4 y}{5y^{-1}}\right)^{-2} = \left(\dfrac{5y^{-1}}{3x^4 y}\right)^2$

$= \dfrac{5^2 y^{-2}}{3^2 x^8 y^2} = \dfrac{25 y^{-2-2}}{9x^8} = \dfrac{25 y^{-4}}{9x^8} = \boxed{\dfrac{25}{9x^8 y^4}}$

OR

$\left(\dfrac{3x^4 y}{5y^{-1}}\right)^{-2}$
$= \left(\dfrac{3x^4 y \cdot y^1}{5}\right)^{-2}$
$= \left(\dfrac{3x^4 y^2}{5}\right)^{-2}$
$= \left(\dfrac{5}{3x^4 y^2}\right)^2$

$\dfrac{5^2}{3^2 (x^4)^2 (y^2)^2}$
$= \dfrac{25}{9x^8 y^4}$

27. Write as an **entire radical**: $5\sqrt[3]{16}$

$5 = \sqrt[3]{125}$

so $5\sqrt[3]{16}$
$= \sqrt[3]{125} \cdot \sqrt[3]{16}$
$= \sqrt[3]{125 \cdot 16} = \boxed{\sqrt[3]{2000}}$

28. A square has an area of 32 cm². What is the **side length** of the square as a **radical in simplest form?**

s = side length

A = 32 cm²
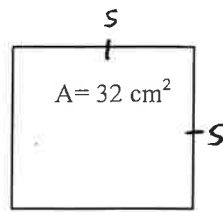
$$A = s^2$$
$$32 = s^2$$
$$\sqrt{s^2} = \sqrt{32}$$
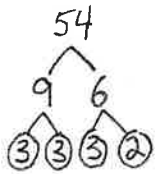$$s = \sqrt{32}$$
$$s = \sqrt{16} \cdot \sqrt{2}$$
$$s = 4\sqrt{2}$$

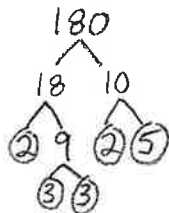biggest perfect square factor of 32 is 16!

side length is $4\sqrt{2}$ cm

29. What is the **greatest common factor** of $18x^2y^3$, $30x^3y$, and $8y^4$?

Biggest number and variable(s) that divide into each term... = $2y$

30. Find the **Least Common Multiple** of 54 and 180

54
9 6
③③③②
$54 = 2 \cdot 3^3$

180
18 10
②9 ②⑤
③③
$180 = 2^2 \cdot 3^2 \cdot 5$

$54 = 2^1 \cdot 3^3$
$180 = 2^2 \cdot 3^2 \cdot 5^1$

now, take the highest power of each unique prime...

$$LCM = 2^2 \cdot 3^3 \cdot 5^1$$
$$LCM = 4 \cdot 9 \cdot 5$$
$$* \; LCM = 540$$

31. Expand and simplify: $(x + 5)(x - 4)(2x + 9)$

$$= (x+5)(2x^2 + 9x - 8x - 36)$$
$$= (x+5)(2x^2 + x - 36)$$
$$= 2x^3 + x^2 - 36x + 10x^2 + 5x - 180 \quad * \text{ combine like terms}$$
$$= 2x^3 + 11x^2 - 31x - 180$$

32. Factor the following: $6x^2 - 19x - 7$.

no GCF, $a = 6$, decomp!

$$= 6x^2 + 2x - 21x - 7$$

$-21 \times 2 = -42$ $(6x - 7)$
$-21 + 2 = -19$

$$= 2x(3x + 1) - 7(3x + 1)$$
$$= (3x + 1)(2x - 7)$$

33. FULLY FACTOR the following:

perfect square   perfect square

$16x^4 - 1$ ← difference of squares!

$= (4x^2 + 1)(4x^2 - 1)$ — another difference of squares!

$= (4x^2 + 1)(2x + 1)(2x - 1)$

34. FULLY FACTOR the following:

GCF of 2!

$2x^4 - 2x^2 - 24$

$= 2(x^4 - x^2 - 12)$ ← now, $a = 1$!

$\dfrac{-4 \times 3 = -12}{-4 + 3 = -1}$

diff. of squares!

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

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

35. Simplify: $(-125z^6)^{\frac{2}{3}}$

flower power!

$= (-125)^{\frac{2}{3}}\left(z^{\frac{6}{1}}\right)^{\frac{2}{3}}$

$= \left(\sqrt[3]{-125}\right)^2 z^{\frac{12}{3}}$

$= (-5)^2 z^4$

$= 25z^4$

36. Expand and simplify: $(x + 2)(x^2 - 3x + 8)$

$= x^3 - 3x^2 + 8x + 2x^2 - 6x + 16$

$= x^3 - x^2 + 2x + 16$

37. Factor the following: $x^2 + 3x - 40$

(2 marks)

$a = 1$, simple way!

$8 \times -5 = -40$

$8 + -5 = 3$

$$= (x + 8)(x - 5)$$

38. Factor the following: $6x^2 + 19x + 10$

no GCF, $a = 6$, decomp!

$$= 6x^2 + 15x + 4x + 10$$

$15 \times 4 = 60 \ (6 \times 10)$

$15 + 4 = 19$

$$= 3x(2x + 5) + 2(2x + 5)$$

$$= (2x + 5)(3x + 2)$$

39. FULLY FACTOR the following: $98x^2 - 18$

GCF is 2!

now, diff. of squares!

$$= 2(49x^2 - 9)$$

$$= 2(7x + 3)(7x - 3)$$

40. State whether the following are relations, functions or one-to-one functions

a. $(4, 2)$, $(3, 0)$, $(7, 1)$, $(1, 0)$ relation Ⓨ/N, function Ⓨ/N, 1-to-1 function Y/Ⓝ

no repeats in domain   *repeated 0's in range*

b. $(1, 5)$, $(2, 9)$, $(4, 17)$, $(5, 21)$ relation Ⓨ/N, function Ⓨ/N, 1-to-1 function Ⓨ/N

no repeats in domain   *no repeats in domain ⓞ̶ⓡ̶ range!*

c. $(5, -2)$, $(1, 1)$, $(5, 2)$, $(1, -1)$ relation Ⓨ/N, function Y/Ⓝ, 1-to-1 function Y/Ⓝ

↳ repeats in domain   ↳ can't be if not a function
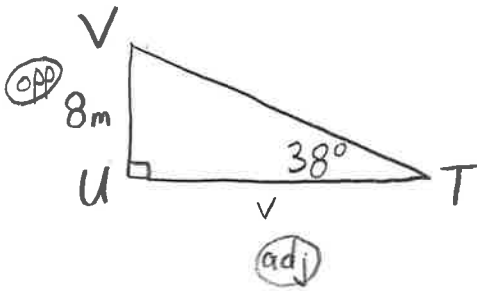
41. This brace is 2.75 m long and must be anchored 1.5m from the base of the wall. **What angle does the brace make with the ground?** *Nearest tenth*

Wall panel

Brace 2.75 m (hyp)

1.5 m adj

C A/H, use cos!
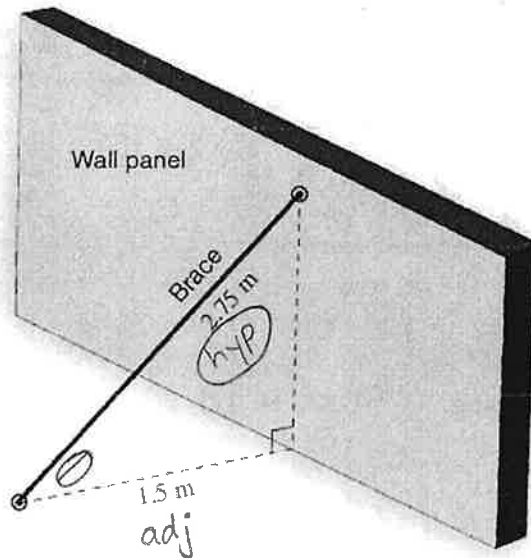
$$\cos \theta = \frac{1.5}{2.75}$$

$$\angle \theta = \cos^{-1}\left(\frac{1.5}{2.75}\right)$$

$$\angle \theta = 56.9°$$

The angle the brace makes with the ground is 56.9°

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42. In △TUV, UV = 8 m, ∠U = 90°, and ∠T = 38°. Determine the length of UT, to the nearest metre.

V
OPP 8m
U 38° T
   v
   (adj)

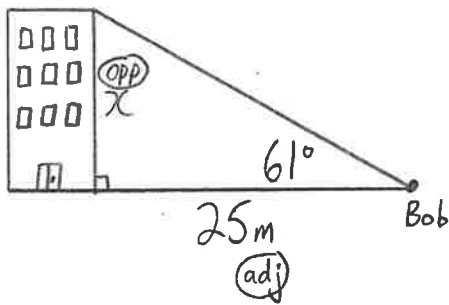find UT... side v !

$\dashv \underset{A}{\overset{O}{}}$, use tan !

$\tan 38° = \dfrac{8}{v}$

$V = \dfrac{8}{\tan 38°}$

→ V = 10.239...

side UT (v) has a length of 10m

43. Bob is standing on a surveyors mark 25 m from the base of a building. He measures a 61° angle of elevation to the top of the building. How tall is the building to the nearest metre?

OPP x
61°
25m
(adj)
Bob

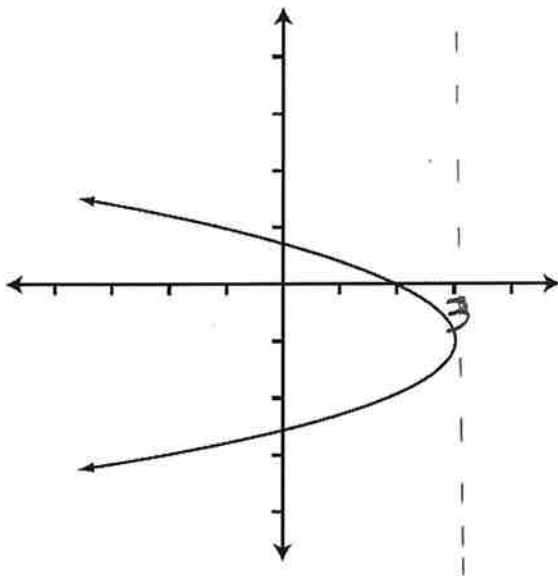$\dashv \underset{A}{\overset{O}{}}$, use tan !

$(\tan 61°)^{\times 25} = \left(\dfrac{x}{25}\right)^{\times 25}$

$x = (\tan 61°) \times 25$

$x = 45.101$
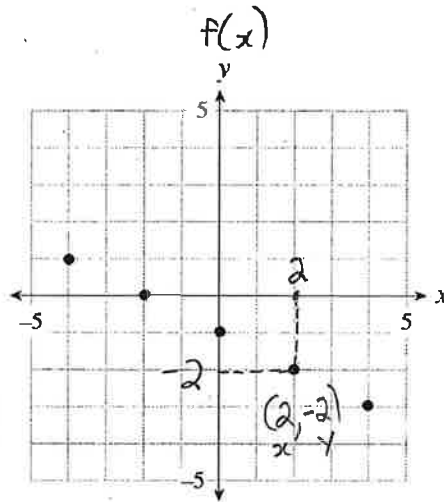
The building is 45m tall

44. What is the **domain** and **range** of the following:

Domain: $x \le 3$ Range: $y \in \mathbb{R}$

"all real #s"

Use the following graph to answer question 45

$f(x)$

45. Determine the value of x if $f(x) = -2$

"y" $= -2$

what is the x value where "y" is -2?

$(2, -2)$

$\boxed{x = 2}$ when $f(x)$ is -2
"y"

46. The point $(6, k)$ is on a line that has a y-intercept of -2, and is **perpendicular** to the line $y = \frac{2}{3}x + 4$. What is the value of k?

flip and change sign

slope $= \frac{2}{3}$, $\therefore$ slope of perp. is $\frac{-3}{2}$.

new line slope $= -\frac{3}{2}$, y-int is -2,

So eqn. is $\boxed{y = \frac{-3}{2}x - 2}$
($y = mx + b$)

$x \, y$

$y = \frac{-3}{2}x - 2$ through $(6, k)$

$k = \frac{-3}{2}(6) - 2$

$k = -9 - 2$

$k = -11$

$\boxed{k = -11}$

47. Carly and Joel buy some Hot Dogs and some Smoothies for their friends at the Saanich Fair.

① Carly Bought 3 Hot Dogs and 4 Smoothies for a total of $33.75. ② Joel bought 5 Hot Dogs and 2 Smoothies for $35.25. How much did it cost to buy one **Smoothie**?

let H = cost for one Hot Dog, let S = cost for one Smoothie

Carly ① $(3H + 4S = 33.75) \times -5$ } to get $-15H$ and $15H$
Joel ② $(5H + 2S = 35.25) \times 3$

① $-15H - 20S = -168.75$
⊕ ② $15H + 6S = 105.75$
_____
$-14S = -63$
$\overline{-14} \quad \overline{-14}$

$S = 4.50$

One Smoothie Costs $4.50

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48. What is $\left(\sqrt[4]{x^3}\right)\left(\sqrt[8]{x^{10}}\right)$ when written as a single power of x?

root ⌄ power ⌄ root ⌄ power

$$= x^{\frac{3}{4}} \cdot x^{\frac{10}{8}} \leftarrow \text{reduce!}$$

$$= x^{\frac{3}{4}} \cdot x^{\frac{5}{4}} \leftarrow \text{multiply powers w/ same base...ADD exponents!}$$

$$= x^{\frac{3}{4}+\frac{5}{4}} = x^{\frac{8}{4}} = \boxed{x^2}$$

use flower power!

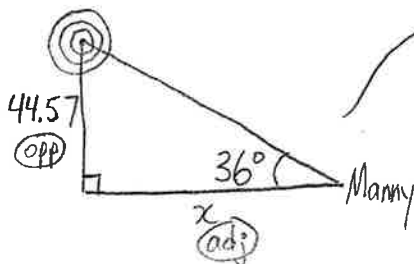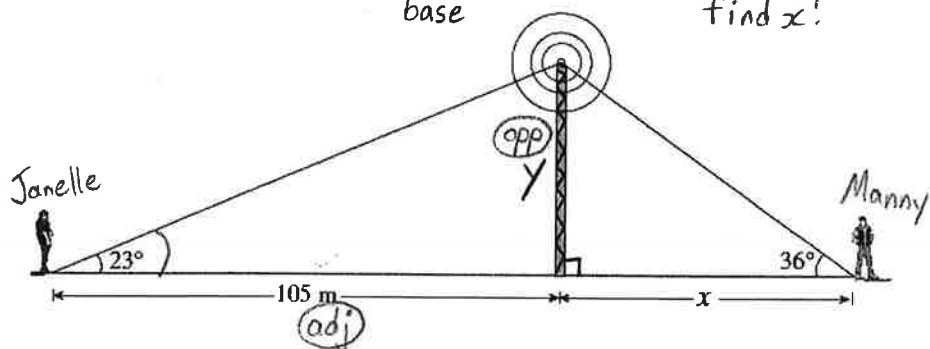$x^{\frac{y}{z}}$ $y \leftarrow$ power (flower) $z \leftarrow$ root

49. Janelle and Manny are standing on opposite sides of a cell phone tower. Janelle is standing 105m from the tower. Her angle of elevation to the tower is 23°. Manny's angle of elevation to the top of the tower is 36°. What is the **distance from Manny to the ▓▓ of the tower?** *Answer to one decimal place.*

base   find x!

Find y: (ht. of tower)

$\frac{T\,O}{A}$, use tan!

$$\left(\tan 23°\right)^{\times 105} = \left(\frac{y}{105}\right)^{\times 105}$$

$$y = \left(\tan 23°\right) \times 105$$

$$y = 44.57\,m$$

Janelle   23°   ⊢—— 105 m ——⊣ (adj)   y (opp)   Manny   36°   ⊢— x —⊣

44.57 (opp)   36°   —Manny   x (adj)

$\frac{T\,O}{A}$, use tan!

$$\tan 36° = \frac{44.57}{x}$$

$$x = \frac{44.57}{\tan 36°}$$

$$x = 61.3\,m$$

Distance from Manny to base of tower is 61.3 m

50. Sketch and **solve** the following triangle ABC: *Angle C* $= 90°$, *side a* $= 6.7m$, *side b* $= 7.9m$

to nearest tenth

A   7.9 m (adj)   c   C   6.7 m (opp)   B

find ∠A:

$\frac{T\,O}{A}$, use tan!

$$\tan A = \frac{6.7}{7.9}$$

$$\angle A = \tan^{-1}\left(\frac{6.7}{7.9}\right)$$

$$\angle A = 40.3°$$

find ∠B:
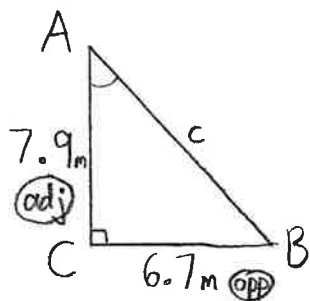
$$\angle B = 180° - 90° - 40.3°$$

$$\angle B = 49.7°$$

find c: pythag!

$$(7.9)^2 + (6.7)^2 = c^2$$

$$62.41 + 44.89 = c^2$$

$$107.3 = c^2$$

$$c = \sqrt{107.3}$$

$$c = 10.4\,m$$

Side c = __10.4__ m
Angle A = __40.3°__
Angle B = __49.7°__

51. Pete earns an annual salary of $67 300. This year he will receive a 4% bonus. Scott earns $1040/week in wages and an average of $170 in tips per week. **Who earned more gross income this year**, and <u>by how much</u>?

Pete:

4% of 67300 = 0.04×67300 = $2692 ← Bonus pay

+ $67300 ← Salary

$69992

Scott:

$1040 + $170 = $1210/wk

$1210/wk × 52 weeks = $62920

difference:

69992 − 62920 = $7072

Pete earned more, by $7072

52. Janet's <u>net</u> pay is $1164 for a 35 hour week. Her personal annual taxes are $14 763, CPP is $2564 and EI is $836. What is her **gross** <u>bi-weekly</u> pay? What is her **gross pay per hour**?

gross = net + deductions

annual net pay = 1164 × 52 = $60,528

annual gross = 60,528 + 14763 + 2564 + 836 = $78691/year

Bi-weekly gross = 78691 ÷ 26 = $3026.58 ← Bi-weekly

Hourly gross = 3026.58 ÷ 70 = $43.24/hr

# of hours every 2 weeks (35×2)

Gross Bi-Weekly Pay: $3026.58

Gross Pay Per Hour: $43.24

53. Determine the amount of total tax on Duffy McTaxersson's gross earnings of $94 000. Assume CPP and EI have been paid and they are tax credits.

(55 300 and over) **CPP:** $= max = \boxed{\$ 2564.10}$

(51 300 and over) **EI:** $= max = \boxed{\$ 836.19}$

Total (CPP + EI):
$\$ 2564.10 + \$ 836.19 = \boxed{\$ 3400.29}$

Fed tax:
$B1 = max = \underline{\$ 6887.40}$

$B2 = max = \underline{\$ 9412.58}$

(B3 minimum) $B3 = \overset{gross}{94000} - 91831 = \$ 2169 \times 0.\overset{amount @ 26\%}{26} = \$ \underline{563.94}$

$\underset{B1}{\$ \underline{6887.40}} + \underset{B2}{\$ \underline{9412.58}} + \underset{B3}{\$ \underline{563.94}} = \boxed{\$ 16863.92}$

Fed Tax Credits: $= (Basic\ Fed.\ credit + CPP/EI) \times 0.15$
$= (12813 + 3400.29) \times 0.15$
$= (16213.29) \times 0.15 = \boxed{\$ 2431.99}$

Fed Total Tax: $= \$ 16863.92 - 2431.99 = \boxed{\$ 14431.93}$ ✱

Prov tax:
$B1 = max = \$ \underline{1968.24}$

$B2 = max = \$ \underline{2995.22}$

$B3 = max = \$ \underline{1209.92}$

$B4 = 94000 - 89320 = \$ 4680 \times 0.\overset{amount @ 12.29\%}{1229} = \$ \underline{575.17}$

$\underset{B1}{\$ \underline{1968.24}} + \underset{B2}{\$ \underline{2995.22}} + \underset{B3}{\$ \underline{1209.92}} + \underset{B4}{\$ \underline{575.17}} = \boxed{\$ 6748.55}$

Prov Tax Credits: $= (Basic\ Prov.\ Credit + CPP/EI) \times 0.0506$
$= (10207 + 3400.29) \times 0.0506$
$= (13607.29) \times 0.0506 = \boxed{\$ 688.53}$

Prov Total Tax: $= \$ 6748.55 - \$ 688.53 = \boxed{\$ 6060.02}$ ✱

Total Tax: $= Total\ Fed.\ Tax + Total\ Prov.\ Tax$

$= \$ 14431.93 + \$ 6060.02 = \boxed{\overset{total\ tax}{\$ 20491.95}}$

(h, T)

54 A Plumbing company charges a fixed amount, plus an hourly rate for a service call. A two hour service call is $145, and a four hour service call is $255.

$(2, 145)$ $(4, 255)$

a. Write the equation that shows how the total cost, T, depends on the number of hours, h, and the fixed cost, C. Use R for hourly rate.   think... $y = mx + b$

$$T = Rh + C$$

rate ↗ (like slope)

fixed cost... initial value (like y-intercept)

b. Find the hourly rate.

like finding slope...   use $(2, 145)$ and $(4, 255)$
x_1 y_1 x_2 y_2

$$slope = \frac{y_2 - y_1}{x_2 - x_1} = \frac{255 - 145}{4 - 2} = \frac{110}{2} = \$55/hr$$

hourly rate (R)

c. Find the fixed amount cost.

now... $T = 55h + C$ use $(2, 145)$
$\quad\quad 145 = 55(2) + C$ h T
$\quad\quad 145 = 110 + C$
$\quad\quad -110 \quad\quad -110$
$\quad\quad 35 = C$

$$C = \$35$$ Fixed cost

d. Write the equation that now describes this relation, and use it to find the total cost of 27 hours of work.

$T = Rh + C$

now... $T = 55h + 35$ equation

$h = 27...$ $T = 55(27) + 35$

$$T = \$1520$$ cost of 27h

Equation: $T = 55h + 35$

Cost of 27 hours of work: $\$1520$

e. Find the domain and range:

(h) Domain: $\{0, 1, 2, 3, 4, 5, 6, 7, ...\}$

(T) Range: $\{35, 90, 145, 200, 255, 310, ...\}$

Fixed cost   +55   +55