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Foundations of Mathematics & Pre-Calculus 10 Practice Exam

1) Find and correct the mistake for each question:

a)

$$\begin{array}{r} 21n^2 - 41n + 10 \quad - \quad - = 210 \\ 21n^2 - 6n - 35n + 10 \quad - + - = -41 \\ \hline 3n(7n-2) - 5(7n-2) \\ \hline (3n-5)(7n-2) \end{array}$$

Should be

$$(3n-5)(7n-2)$$

b)

$$\begin{array}{r} (3x+5)(5x-4) \\ 15x^2 - 12x + 25x - 20 \\ \hline 30x^2 - 37x - 18 \end{array}$$

$$15x^2 + 13x - 20$$

2) Factor Each Question Fully:

a) $b^2 - 4b - 5$

$$\begin{array}{l} \underline{1} \quad \underline{-5} = -5 \\ \underline{1} \quad \underline{+5} = +4 \end{array}$$

$$(b+1)(b-5)$$

c) $36p^2 - 9$

$$\begin{array}{l} \boxed{36p^2} \quad 6p \quad \boxed{-9} \quad -3 \\ 6p \quad \quad \quad +3 \end{array}$$

$$(6p-3)(6p+3)$$

b) $20x^2 + 39x + 7$

$$20 \cdot 7 = 140$$

$$\begin{array}{l} \text{Then } \underline{35} \cdot \underline{4} = 140 \\ \underline{35} \quad \underline{+4} = 39 \end{array}$$

$$\begin{array}{r} 20x + 35x \quad | \quad 4x + 7 \\ \hline 5x(4x+7) \quad | \quad 1(4x+7) \\ \hline (4x+7)(5x+1) \end{array}$$

d) ~~$8x^2 - 8x - 6$~~

$$9x^2 + 30x + 25$$

$$\begin{array}{l} \boxed{9x^2} \quad 3x \\ 3x \end{array}$$

$$\begin{array}{l} \boxed{25} \quad 5 \\ 5 \end{array}$$

$$(3x+5)(3x+5)$$

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

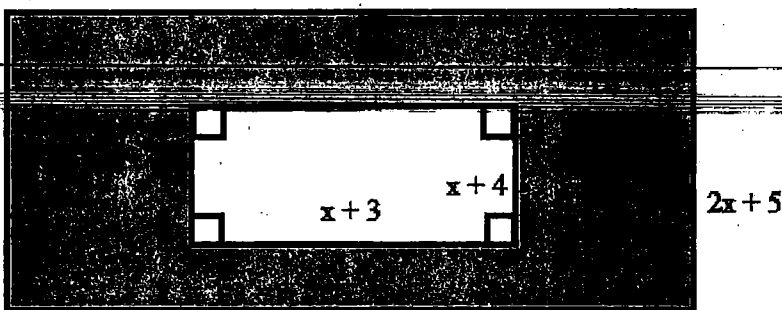
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3) Find the area of the shaded region in the following questions:

a)



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

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

$$6x^2 + 11x - 10$$

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

$$x^2 + 4x + 3x + 12$$

$$x^2 + 7x + 12$$

$$6x^2 + 11x - 10$$

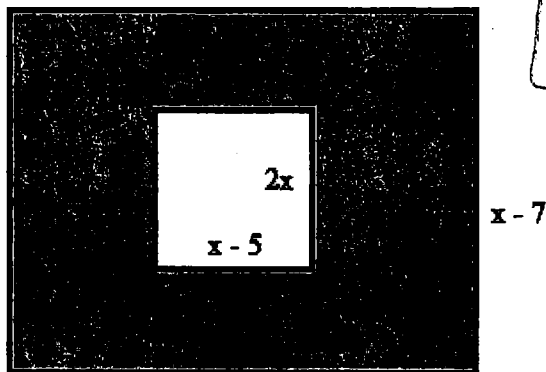
$$- (x^2 + 7x + 12)$$

$$5x^2 + 4x - 22$$

then: $6x^2 + 11x - 10 - (x^2 + 7x + 12)$

b)

* Because you are subtracting the small rectangle, you must change all the signs.*



$$(3x+5)(x-7)$$

$$3x^2 - 21x + 5x - 35$$

$$3x^2 - 16x - 35$$

$$2x(x-5)$$

$$(2x^2 - 10x)$$

$$3x^2 - 16x - 35$$

$$- (2x^2 - 10x)$$

$$x^2 - 6x - 35$$

* Again, subtract the small rectangle so change all small rectangle sign.

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4) Evaluate

$$256^{\left(\frac{3}{4}\right)}$$

$$\left(\sqrt[4]{256}\right)^3$$

$$(4)^3$$

$$64$$

5) Evaluate and leave in fractional form if necessary

$$\left(-\frac{27}{64}\right)^{\frac{4}{3}}$$

$$\frac{(-27)^{4/3}}{(64)^{4/3}}$$

$$\frac{(\sqrt[3]{-27})^4}{(\sqrt[3]{64})^4} = \frac{(-3)^4}{(4)^4}$$

$$= \frac{81}{256}$$

6) Use Exponent Laws to simplify each of the following (only positive exponents for your answers):

a)

$$\frac{(2.5^{-5})(2.5^7)}{(2.5^{-2})}$$

$$\frac{2.5^{(-5+7)}}{2.5^{(-2)}}$$

$$\frac{2.5^{(2)}}{2.5^{(-2)}}$$

$$2.5^{(2-(-2))}$$

$$(2.5)^4$$

b)

$$a^{-3}b^7c^{-5} * a^{-2}b^5c^{-4}$$

$$a^{(-3+(-2))} b^{(7+5)} c^{(-5+(-4))}$$

$$a^{-5}b^{12}c^{-9}$$

$$\frac{b^{12}}{a^5c^9}$$

7) Express in simplest form using only positive exponents

$$\frac{12p^4q^{-5}}{16p^2q^4}$$

$$\frac{3}{4} p^{(4-2)} q^{(-5-4)}$$

$$\frac{3p^2q^{-9}}{4}$$

$$\frac{3p^2}{4q^9}$$

$$\frac{12}{16} \cdot \frac{p^4}{p^2} \cdot \frac{q^{-5}}{q^4}$$

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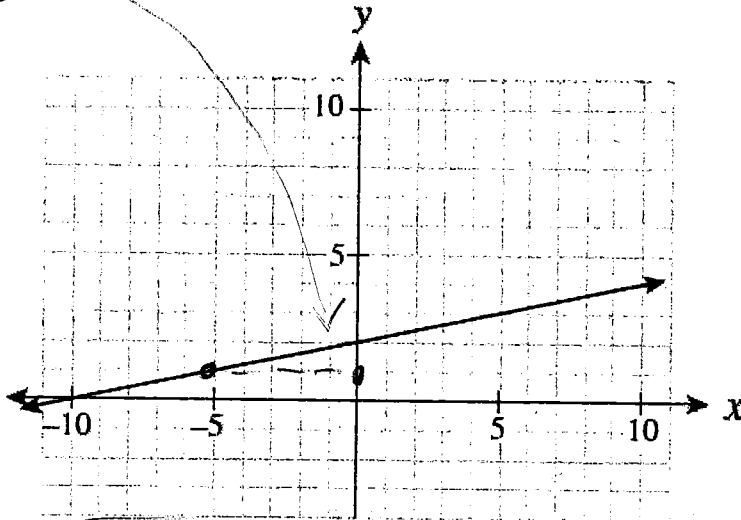
8) The distance a ship travels is a function of time since departing. What is the dependent variable?

time can not be controlled.

always independent

The distance is the dependent variable.

9) This is the graph of for the function $f(x) = \frac{1}{5}x + 2$. What is the domain value when the range value is +1?



Domain value is -5

10) For the function $f(x) = -\frac{3}{5}x - 5$, determine x when $f(x) = 25$

$$25 = -\frac{3}{5}x - 5$$

$$5(30) = 5\left(-\frac{3}{5}x\right)$$

$$150 = -3x$$

$$x = -50$$

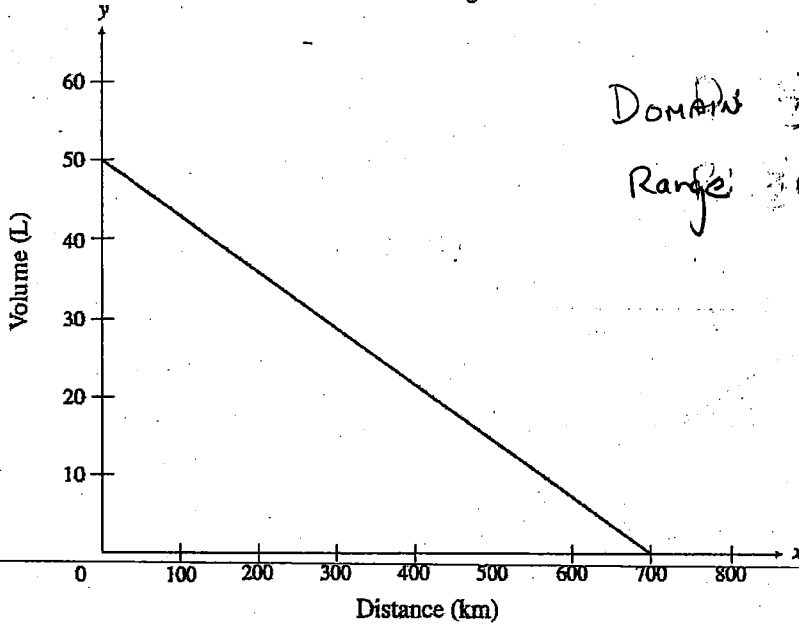
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11) This graph shows the amount of gasoline remaining in a car as a function of distance driven. Determine the domain and range.

Amount of Gasoline Remaining vs. Distance Driven



Domain: $0 \leq d \leq 700$

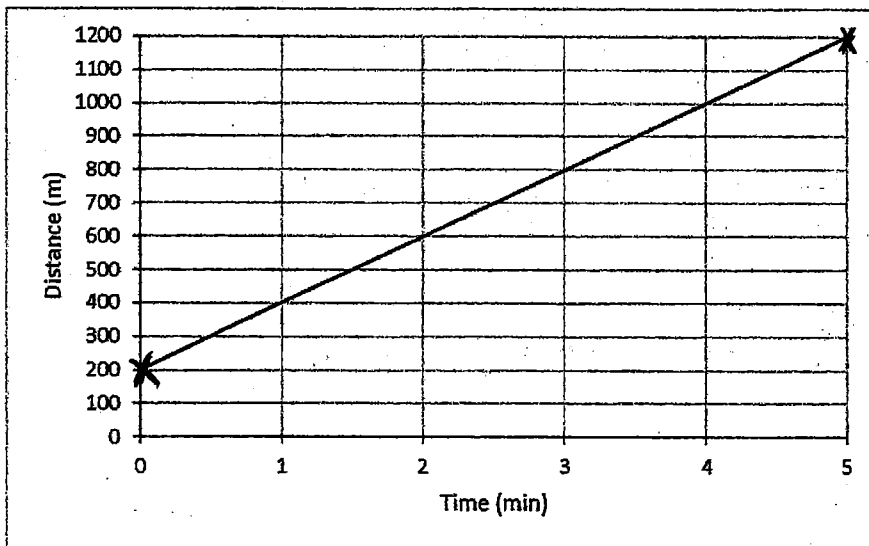
Range: $0 \leq V \leq 50$

10/24

$0 \leq x \leq 700$

$0 \leq y \leq 50$

12) What is the vertical intercept and the rate of change of this graph?



Vert. Int = 200m

Rate:

$\frac{1000\text{m}}{5\text{min}}$

200m/min

OR

$\frac{200}{1} = 200\text{m/min}$

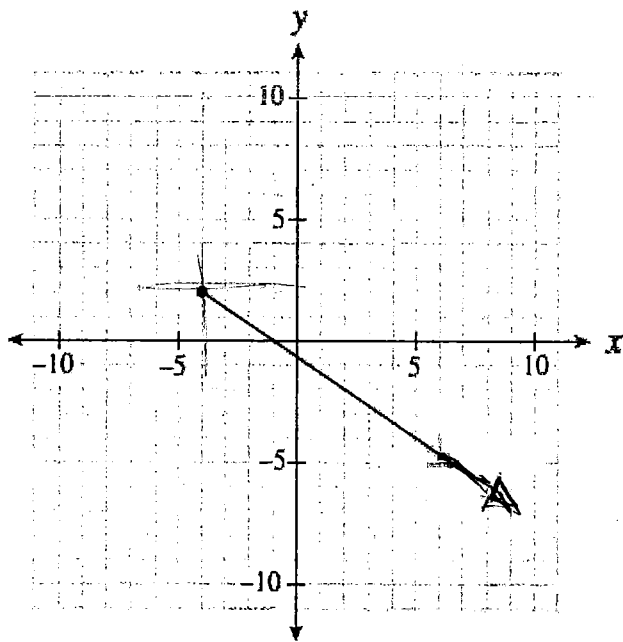
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13) What are the domain and range of the following graphs?

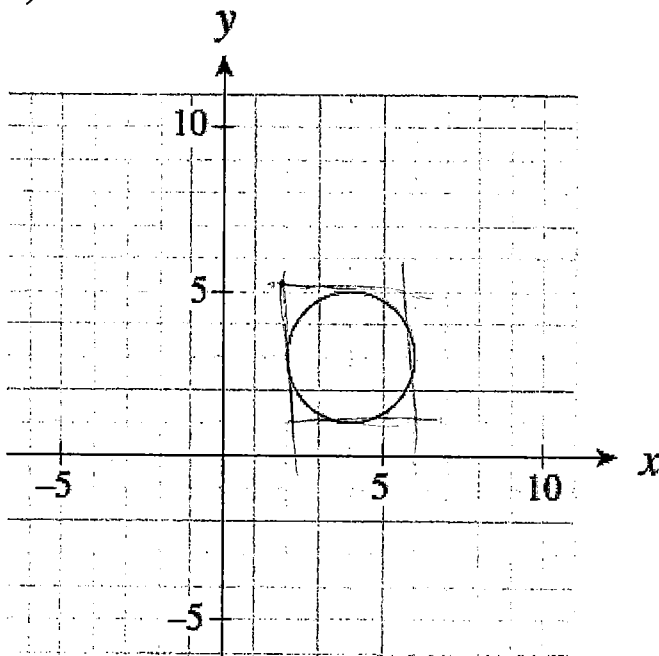
a)



Domain: $x \geq -4$

Range: $y \leq 2$

b)



$2 \leq x \leq 6$

$1 \leq y \leq 5$

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14) A straight section of a downhill ski course is 32 m long. It drops 14 m in height. Determine the slope of this part of the course.

$$m = \frac{\text{rise}}{\text{run}} = \frac{-14}{32}$$

$$= \frac{-7}{16}$$

15) Calculate the slope between the points (5, 4) and (1, 2).

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2 - 4}{1 - 5}$$

$$= \frac{-2}{-4} = \frac{1}{2}$$

16) Determine the slope of the linear relation $4x + 7y + 21 = 0$.

$$4x + 7y + 21 = 0$$

$$-4x \quad -21$$

$$\frac{7y}{7} = \frac{-4x - 21}{7}$$

$$y = -\frac{4}{7}x - 3$$

17) Write an equation in slope-point form for the line that passes through A (-1, -1) and B (-11, -3).

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1 - (-3)}{-1 - (-11)}$$

$$= \frac{-1 + 3}{-1 + 11} = \frac{2}{10} = \frac{1}{5}$$

use A(-1, -1) OR B(-11, -3)

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

$$y + 1 = \frac{1}{5}(x + 1)$$

$$\text{OR}$$

$$y + 3 = \frac{1}{5}(x + 11)$$

18) A line has x-intercept -7 and y-intercept 3. Determine the slope of a line perpendicular to this line.

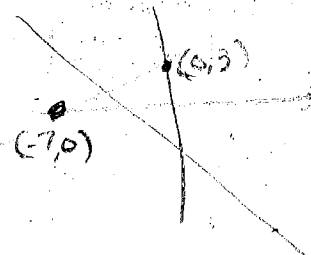
$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - 0}{0 - (-7)}$$

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

⤴ (-7, 0) ⤴ (0, 3)

⊥ line has

$$m = \frac{7}{3}$$



19) Determine the slope of a line that is perpendicular to this line: $25x + 10y - 20 = 0$

$$25x + 10y - 20 = 0$$

$$-25x \quad +20$$

$$\frac{10y}{10} = \frac{-25x + 20}{10}$$

$$y = -\frac{5}{2}x + 2$$

⊥ line has

$$m = \frac{2}{5}$$

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20) Solve the following systems:

a)

$$\begin{aligned} 3x - y &= 8 \\ x + y &= 12 \end{aligned}$$

$$\begin{array}{r} 3x - y = 8 \\ x + y = 12 \\ \hline 4x = 20 \\ \hline x = 5 \end{array} \quad \begin{array}{r} x + y = 12 \\ 5 + y = 12 \\ -5 \quad -5 \\ \hline y = 7 \end{array}$$

$$\begin{aligned} x + y &= 12 \\ -x &= -x \\ \hline y &= -x + 12 \end{aligned} \quad \boxed{x = 5}$$

$$\begin{array}{r} 3x - y = 8 \\ 3x - (-x + 12) = 8 \\ \hline 3x + x - 12 = 8 \\ 4x - 12 = 8 \\ +12 \quad +12 \\ \hline 4x = 20 \end{array} \quad \begin{array}{r} 3x - y = 8 \\ 3(5) - y = 8 \\ 15 - y = 8 \\ +y \\ \hline 15 = 8 + y \\ -8 \quad -8 \\ \hline 7 = y \end{array}$$

b)

$$\begin{aligned} y &= 4x + 5 \\ 2x + y &= 11 \end{aligned}$$

$$\begin{array}{r} 2x + y = 11 \\ 2x + (4x + 5) = 11 \\ \hline 6x + 5 = 11 \\ -5 \quad -5 \\ \hline 6x = 6 \\ \hline x = 1 \end{array} \quad \begin{array}{r} y = 4x + 5 \\ y = 4(1) + 5 \\ y = 4 + 5 \\ \hline y = 9 \end{array}$$

$$\begin{array}{r} y = 4x + 5 \\ -y \quad -y \\ \hline 4x - y + 5 = 0 \\ -5 \quad -5 \\ \hline 4x - y = -5 \\ 2x + y = 11 \\ \hline 6x = 6 \\ \hline x = 1 \end{array} \quad \begin{array}{r} 2x + y = 11 \\ 2(1) + y = 11 \\ 2 + y = 11 \\ -2 \quad -2 \\ \hline y = 9 \end{array}$$

21) Analyze the system and determine whether it has one solution, no solution, or infinitely many solutions.

$$\begin{aligned} 2c + d &= 5 \\ 3d &= 15 - 6c \end{aligned}$$

Work:

$$\begin{aligned} d &= -2c + 5 \\ 3d &= \frac{-6c + 15}{3} \\ d &= -2c + 5 \end{aligned}$$

Answer: Infinite Solutions
Reason: Same slope, same y-int.

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22) Kelly invested a total of \$1000 between two savings accounts. One account earned 7% per annum and the other account earned 15% per annum. In one year, Kelly earned \$118 on her investments. How much did she invest in the bond that earned 15%?

$$\begin{aligned}x + y &= 1000 \\ 0.15x + 0.07y &= 118\end{aligned}$$

$$x + y = 1000$$

$$y = -x + 1000$$

$$0.15x + 0.07y = 118$$

$$0.15x + 0.07(-x + 1000) = 118$$

$$0.15x - 0.07x + 70 = 118$$

$$0.08x + 70 = 118$$

$$\begin{array}{r}0.08x = 48 \\ \hline 0.08 \quad 0.08\end{array}$$

$$x = \$600$$

She invested

\$600

23) Jim bought 10 plates. Some plates cost \$8 each and the rest cost \$14 each. He spent a total of \$104. How many \$8 plates did he buy?

$$x + y = 10$$

$$8x + 14y = 104$$

$$y = 10 - x$$

$$8x + 14y = 104$$

$$8x + 14(10 - x) = 104$$

$$8x + 140 - 14x = 104$$

$$-6x + 140 = 104$$

$$\begin{array}{r}-6x = -36 \\ \hline -6 \quad -6\end{array}$$

$$x = 6$$

Jim bought

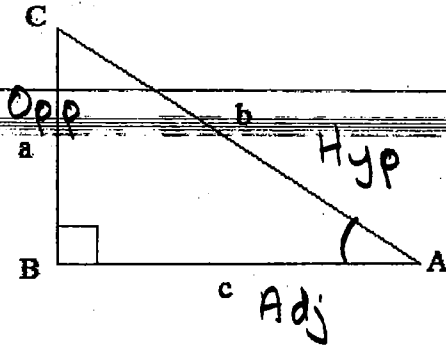
6 of the \$8 plates

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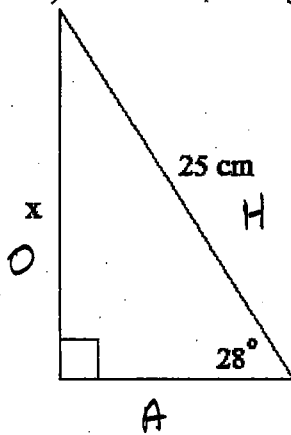
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24) In the diagram below, what is $\sin A$?



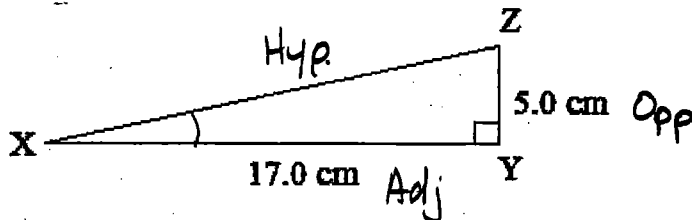
$$\begin{aligned}\sin A &= \frac{\text{Opp}}{\text{Hyp}} \\ &= \frac{\overline{BC}}{\overline{AC}} \quad \text{or} \quad \frac{a}{b}\end{aligned}$$

25) Determine the length of x .



$$\begin{aligned}\sin \theta &= \frac{O}{H} \\ \sin 28^\circ &= \frac{x}{25} \\ 25 \sin 28^\circ &= x \\ x &= 11.7 \text{ cm}\end{aligned}$$

26) Determine the measure of $\angle X$ in the following diagram.



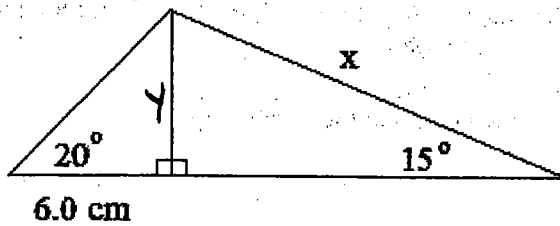
$$\begin{aligned}\tan \theta &= \frac{O}{A} & \theta &= \tan^{-1}\left(\frac{5.0}{17.0}\right) \\ \tan \theta &= \frac{5.0}{17.0} & &= 16^\circ\end{aligned}$$

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27) Given the diagram below, determine the length of x.



$$\tan \theta = \frac{O}{A}$$

$$\tan 20^\circ = \frac{y}{6.0}$$

$$6.0 \tan 20 = y$$

$$y = 2.2 \text{ cm}$$

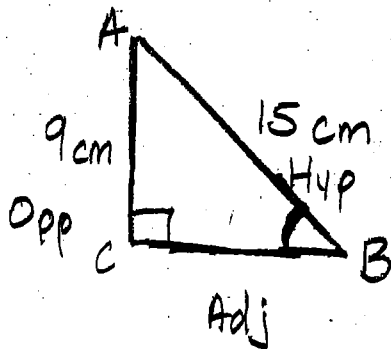
$$\sin \theta = \frac{O}{H}$$

$$x (\sin 15^\circ) = \frac{2.2 \text{ cm}}{\sin 15^\circ}$$

$$x (\sin 15^\circ) = \frac{2.2 \text{ cm}}{\sin 15^\circ}$$

$$x = 8.4 \text{ cm}$$

28) In $\triangle ABC$, $\angle C = 90^\circ$, $AB = 15 \text{ cm}$ and $AC = 9 \text{ cm}$. Draw a diagram and calculate the measure of $\angle ABC$ to the nearest degree.



$$\sin B = \frac{O}{H}$$

$$\sin B = \frac{9}{15}$$

$$B = \sin^{-1}\left(\frac{9}{15}\right)$$

$$= 37^\circ$$

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29) Attending University

You plan on attending UBC to complete a 4 year degree. It costs \$9100 for tuition and books each year. Living in the dorms and food costs an extra \$8800.

a) What will the total cost be to attend UBC and complete the 4 year degree?

$$\begin{aligned}
 C &= 4(\$9100 + \$8800) \\
 &= 4(\$17900) \\
 &= \$71600
 \end{aligned}$$

Total cost: **\$71 600**

b) You plan on taking out a student loan after you graduate/obtain your degree. You plan to re-pay \$300 per month. How many months/years will you be paying off your loan?

$$\begin{array}{r}
 \$71600 \\
 \hline
 \$300 \\
 \hline
 239 \text{ months}
 \end{array}
 \qquad
 \begin{array}{r}
 239 \\
 \hline
 12 \\
 \hline
 19.88 \text{ years}
 \end{array}
 \qquad
 \begin{array}{l}
 239 \text{ months} \rightarrow 19 \text{ years,} \\
 \qquad \qquad \qquad 11 \text{ months}
 \end{array}$$

Total months/years: **19 years, 11 months**

30) Cost of a Car

You want to buy a car and have two options. You can buy a new car or a used car. Compare the costs over a 5 year period. Calculate the total cost of each, explain which option you will choose and justify your answer.

a) Buying a new car:

Cost of a Car: \$29500
Down Payment: \$6000
Interest Rate: 8%

$$\begin{aligned}
 & \$29500 \\
 & - \$6000 \\
 & \hline
 & \$23500 \\
 & \times 0.08 \\
 & \hline
 & = \$1880
 \end{aligned}$$

$$\begin{aligned}
 & \$23500 + \$1880 \\
 & = \$25380
 \end{aligned}$$

Total cost: **\$25380**

b) Buying a used car:

Cost of a Car: \$9500
Yearly Maintenance Cost: \$950

$$\begin{aligned}
 & \$9500 + \$950(5) \\
 & = \$14250
 \end{aligned}$$

Total cost: **\$14 250**

c) Which will you choose?

Used Car

d) Justify and explain why you made the choice you did.

$$\begin{aligned}
 & \text{New Car: } \$25380 \\
 & \text{Used Car: } \$14250 \Rightarrow \text{Save } \$11130 \\
 & \qquad \qquad \qquad \text{over 5 years}
 \end{aligned}$$