

BEDMAS

PREREQUISITE SKILLS

These are the concepts that you **NEED** to know and be able to **DO**. You learned them all in grade 10 math.

1. Operations with Integers: Evaluate

a) $3 + (-6)(-4)$ *mult. first*

$$= 3 + 24$$

$$= 27$$

b) $(-5)^2 = (-5)(-5)$

$$= 25$$

c) -3^4

$$= -3 \times 3 \times 3 \times 3$$

$$= -81$$

sign is not included in the repeated multiplication b/c there're no parentheses that enclose the sign

2. Operations with Rational Numbers

Evaluate $\frac{6}{5} \times \frac{2}{5} \div \frac{-4}{15}$

Step 1: $\frac{6 \times 2}{5 \times 5} \div \frac{-4}{15}$

multiply first two fractions

$$= \frac{12}{25} \div \frac{-4}{15}$$

Step 2: *flip 2nd fraction to multiply*

$$= \frac{12}{25} \times \frac{-15}{4}$$

$$\rightarrow \frac{12 \times -15}{25 \times 4} = \frac{-180}{100} = -\frac{9}{5}$$

3. Evaluating Algebraic Expressions: Find the value of $5x^2y + 6xy - 4y^2 - 1$ if $x = -3$ and $y = 2$

Note = always sub with parentheses \rightarrow follow BEDMAS

$$= 5(-3)^2(2) + 6(-3)(2) - 4(2)^2 - 1$$

$$= 5 \cdot 9 \cdot 2 - 36 - 4 \cdot 4 - 1$$

$$= 90 - 36 - 16 - 1$$

$$= 37$$

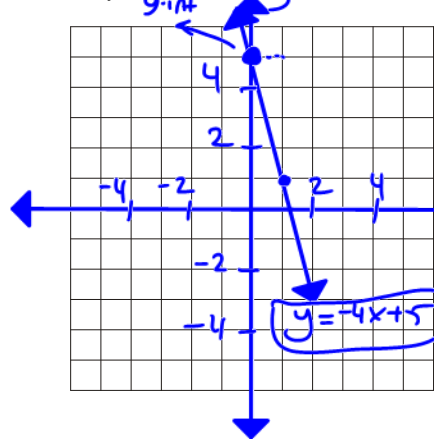
CALCULATOR TIP

$$5 * (-3)^2 * 2 + 6 * -3 * 2 - 4 * 2^2 - 1$$

$$= 37$$

4. Graphing : Name the type of relation, the original (untransformed) function, list the transformations, then graph.

a) $y = -4x + 5$ \rightarrow LINEAR

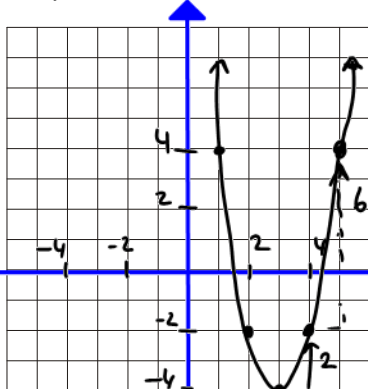


y-int = 5

slope = $\frac{\text{rise}}{\text{run}} = \frac{-4}{1}$

- Plot y-int
- from y-int always go "+" direction as much as your run. (4)
- move as much as rise (-4)

b) $y = 2(x-3)^2 - 4$



① State & plot vertex $V(3, -4)$

② Step pattern
 $a \times (1, 3, 5, \dots)$
 \downarrow
 $2 \times (1, 3, 5)$
 $= 2, 6, 10$

③ from vertex, go always one right then 2 up. repeat the step again.

5. Expanding and Simplifying Algebraic Expressions: Expand and simplify.

a) $(5x^2y)(2xy - 3y^2)$

$$= (5x^2y)(2xy) + (5x^2y)(-3y^2)$$

$$= 10x^{2+1}y^{1+1} - 15x^2y^{1+2}$$

$$= 10x^3y^2 - 15x^2y^3$$

b) $(3x + 2y)(2x - 5y)$ FOIL

$$= 6x^2 - 15xy + 4xy - 10y^2$$

$$= 6x^2 - 11xy - 10y^2$$

c) $\frac{(x^2y^3)^0(6x^3y^4)^2}{(3xy^3)^3}$

$$= \frac{1 \cdot 6^2 x^{3 \cdot 2} y^{4 \cdot 2}}{3^{1 \cdot 3} x^{1 \cdot 3} y^{3 \cdot 3}}$$

$$= \frac{36x^6y^8}{27x^3y^9}$$

$$= \frac{4x^3}{3y}$$

6. Factoring: Factor fully.

a) $x^2 - 25y^2$ *difference of squares*

$$= (\sqrt{x^2} - \sqrt{25y^2})(\sqrt{x^2} + \sqrt{25y^2})$$

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

b) $x^2 - 5x - 6$

$$(x+1)(x-6)$$

Multiply

| M | A | N |
|----|----|------|
| -6 | -5 | 1, 6 |

$$6 = 1 \times 6$$

$$= 2 \times 3$$

c) $6x^2 + 14x + 4$ *GCF first = 2*

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

| M | A | N |
|---|---|------|
| 6 | 7 | 1, 6 |

$$= 2(3x^2 + \underbrace{x}_{\text{GCF}} + \underbrace{6x}_{\text{GCF}} + 2)$$

$$= 2[x(3x+1) + 2(3x+1)]$$

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

7. Solving Equations: Solve.

a) $2x + 5 = 9$

$$2x = 9 - 5$$

$$\frac{2x}{2} = \frac{4}{2}$$

$$\boxed{x = 2}$$

b) $x^2 - 4x + 3 = 0$

$$(x-1)(x-3) = 0$$

$$x-1=0$$

$$\boxed{x=1}$$

$$x-3=0$$

$$\boxed{x=3}$$

$$\therefore \{1, 3\}$$

c) $3x^2 - 8x = 4$

$$3x^2 - 8x - 4 = 0$$

$$a=3 \quad b=-8 \quad c=-4$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-(-8) \pm \sqrt{(-8)^2 - 4(3)(-4)}}{2(3)}$$

$$= \frac{8 \pm \sqrt{112}}{6} = \frac{8 \pm 10.6}{6} = 3.1$$

8. Quadratics – Completing the Square Find the vertex of $h = -2t^2 + 12t + 25$

Your goal is to convert $y = ax^2 + bx + c$ into $y = a(x-h)^2 + k$
 We will do opposite of expanding (factoring) to have $\rightarrow (x-h)^2$

$$= \frac{8 - 10.6}{6} = -0.4$$

$$h = -2\left(\frac{-2t^2}{-2} + \frac{12t}{-2}\right) + 25$$

factor out "-2" from the first two terms.

$$= -2(t^2 - 6t) + 25$$

we need a term here to have a perfect square trinomial.

$$= -2(t^2 - 6t + 9 - 9) + 25$$

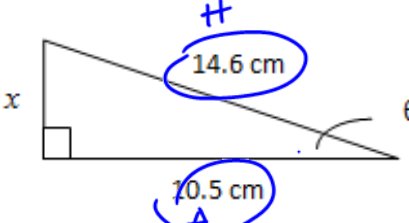
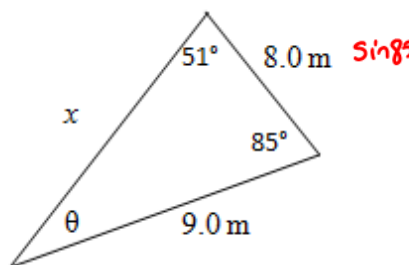
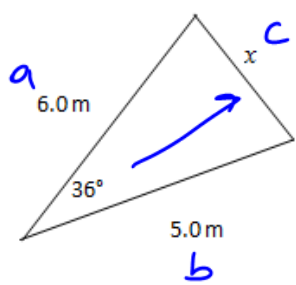
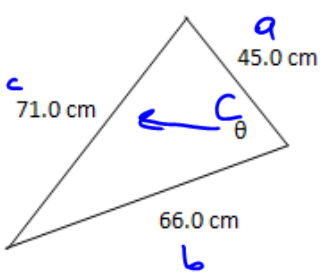
$$= -2(t^2 - 6t + 9) + 18 + 25$$

$$\boxed{h = -2(t-3)^2 + 43}$$

you square a binomial to get a P.S.T

$$\underbrace{(a+b)^2}_{\text{binomial}} = \underbrace{a^2 + 2ab + b^2}_{\text{P.S.T}}$$

9. **Trigonometry:** Determine the value of θ rounded to nearest degree and/or x , rounded to nearest tenth

| | |
|---|--|
| <p>a)</p>  | <p><u>Finding x</u> $x^2 + (10.5)^2 = (14.6)^2$ $x^2 + 110.25 = 213.16$ $x^2 = 213.16 - 110.25$ $x^2 = 102.91$ $x = 10.1$</p> <p><u>Finding θ</u> $\cos \theta = \frac{A}{H}$ $\cos \theta = \frac{10.5}{14.6}$ $\cos^{-1}\left(\frac{10.5}{14.6}\right) = \theta$ $\theta = 44^\circ$</p> |
| <p>b)</p>  | <p><u>Finding "x"</u> $\frac{x}{\sin 85} = \frac{9}{\sin 51}$ $x = \frac{9 \cdot \sin 85}{\sin 51}$ $x = 11.5$</p> <p><u>Finding NEM θ</u> $\frac{\sin \theta}{8} = \frac{\sin 51}{9} \cdot 8$ $\sin \theta = 0.6908$ $\sin^{-1}(0.6908) = \theta \Rightarrow \theta \approx 44$</p> |
| <p>c)</p>  | <p>$c^2 = a^2 + b^2 - 2ab \cos C$ $x^2 = 6^2 + 5^2 - 2 \cdot 6 \cdot 5 \cdot \cos 36 \rightarrow$ punch all the numbers on θ into your calc $x^2 = 12.4590$ $x \approx 3.5$</p> |
| <p>d)</p>  | <p>$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$ $\cos \theta = \frac{(45)^2 + (66)^2 - (71)^2}{2 \cdot (45)(66)}$ $\cos \theta = \frac{1340}{5940}$ $\cos^{-1}\left(\frac{1340}{5940}\right) = \theta$ $\theta \approx 77^\circ$</p> |

MORE PRACTICE

| | |
|--|---|
| <p>1. For the line $3x - 5y = 10$ state:</p> <p>a) the slope</p> <p>b) the y-intercept</p> $\frac{-5y}{-5} = \frac{-3x + 10}{-5}$ $y = \frac{3}{5}x - 2$ <p>a) slope is $\frac{3}{5}$</p> <p>b) y int = -2</p> | <p>9. Factor fully. <i>GCF x</i></p> <p>a) $9x^3 - 25x = x(9x^2 - 25)$ $= x(3x-5)(3x+5)$</p> <p>b) $6x^2 + 10x + 4$ $x = -1 \quad x = -0.7$</p> <p style="text-align: right;"><i>D.O.S</i></p> |
| <p>2. Expand and Simplify $(3x - 1)(4x + 5)$</p> $= (3x)(4x) + (3x)(5) + (-1)(4x) + (-1)(5)$ $= 12x^2 + 15x - 4x - 5$ $= 12x^2 + 11x - 5$ | <p>10. Solve each equation using the most appropriate method. Give answers to one decimal place only where appropriate.</p> <p>a) $x^2 + 4x - 21 = 0$ $(x-3)(x+7) = 0$ $x = 3 \quad x = -7 \quad \therefore \{-7, 3\}$</p> <p>b) $(x+2)(x-3) = 3(x+1) - 9$ $x^2 - x - 6 = 3x + 3 - 9$ $x^2 - x - 6 - 3x - 3 + 9 = 0$ $x^2 - 4x = 0$ $x(x-4) = 0$ $x = 0 \quad x = 4 \quad \therefore \{0, 4\}$</p> <p>c) $0 = x^2 + 4x - 1$ use quadratic formula $\{-4.2, 0.2\}$</p> |
| <p>3. Factor</p> <p>a) $m^2 - 81 \rightarrow \text{D.O.S}$ $= (m-9)(m+9)$</p> <p>b) $x^2 - 7x - 18 = (x+2)(x-9)$</p> | <p>11. Complete the square and state the vertex.</p> $y = x^2 + 2x - 25$ $= (x^2 + 2x + 1 - 1) - 25$ $= (x^2 + 2x + 1) - 1 - 25$ $= (x+1)^2 - 26$ <p>Vertex is $(-1, -26)$</p> <p style="text-align: right;">$2/2 = 1 \quad (1)^2 = 1$</p> |
| <p>4. the roots of the equation:</p> <p>a) $(x-7)(x+6) = 0$</p> <p><i>x-int</i> $x-7=0 \quad x+6=0$ $\boxed{x=7} \quad \boxed{x=-6}$</p> <p>$\therefore$ Roots are $(-6, 0)$ & $(7, 0)$ OR $\{-6, 7\}$</p> | <p>12. Evaluate. $4^{-2} + \left(\frac{3}{2}\right)^2 - 9^0$ <i>calc tip</i></p> $= \frac{1}{4^2} + \frac{9}{4} - 1$ $= \frac{1}{16} + \frac{9 \cdot 4}{4 \cdot 4} - \frac{1 \cdot 16}{1 \cdot 16}$ $= \frac{1 + 36 - 16}{16} = \frac{21}{16} = 1.3$ |

b) $2x^2 - 3x + 1 = 0$

$2x^2 - 2x - 1x + 1 = 0$ $\begin{array}{c|c|c} M & A & N \\ \hline 2 & -3 & -2, -1 \end{array}$

$2x(x-1) - 1(x-1) = 0$

$(x-1)(2x-1) = 0$

\downarrow
 $x=1$


$2x-1=0$
 $x=\frac{1}{2}$

$\therefore \left\{ \frac{1}{2}, 1 \right\}$

5. Given $y = -3(x-7)^2 + 5$, state:

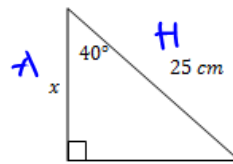
- vertex
- max or min value
- direction of opening

a) Vertex is $(7, 5)$

b)  max value 5

c) down

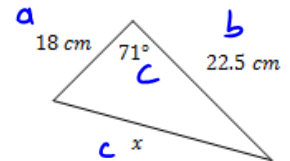
13. Solve for the unknown indicated on each diagram to one decimal place.



$\cos 40 = \frac{x}{25}$

$x = 25 \cdot \cos 40$

$x = 19.1$



$x^2 = 18^2 + (22.5)^2 - 2 \cdot 18 \cdot 22.5 \cdot \cos 71$

$x^2 = 566.5378$

$x = 23.8$

6. Evaluate.

- 6^0
- 2^{-3}

a) $6^0 = 1$


b) $2^{-3} = \frac{1}{2^3}$

$= \frac{1}{8}$

b) $3 = -2x^2 + 8x$
 $0 = -2x^2 + 8x - 3$
use formula
when x is either 0.4
or 3.6

14. An archway has been built over a one-way road. The arch can be modeled by $h = -2x^2 + 8x$ where h is the height of the arch in metres and x is the horizontal distance in metres.

- How wide is the arch?
- At what horizontal distance (to one decimal place) is the height 3 metres?
- What is the maximum height of the arch?

a)  Find intercepts
 $0 = -2x(x-4)$
 $-2x = 0$ $x-4 = 0$
 $x=0$ $x=4$
 \therefore It is 4m

c) $= -2(x^2 - 4x)$
 $= -2(x^2 - 4x + 4 - 4)$
 $= -2(x^2 - 4x + 4) + 8$
 $= -2(x-2)^2 + 8$ $h_{\max} = 8$

7. Solve each system algebraically using the method indicated. Show proper form.

a) SUBSTITUTION

$$\begin{aligned} x + 4y &= 7 \\ 3x - 2y &= -21 \end{aligned}$$

$$\begin{aligned} \textcircled{1} x &= 7 - 4y \\ \text{Sub } \textcircled{1} \rightarrow \textcircled{2} \\ 3(7 - 4y) - 2y &= -21 \\ 21 - 12y - 2y &= -21 \\ -14y &= -21 - 21 \\ -14y &= -42 \\ \frac{-14y}{-14} &= \frac{-42}{-14} \\ y &= 3 \\ x &= 7 - 4(3) \\ x &= -5 \\ \therefore \text{POI is } (-5, 3) \end{aligned}$$

b) ELIMINATION

$$\begin{aligned} \textcircled{1} \frac{2x}{3} - \frac{y}{2} &= 2 \quad \rightarrow \text{multiply by 6} \\ \textcircled{2} 3(x - 5) - 2(y + 3) &= -10 \end{aligned}$$

$$\begin{aligned} \textcircled{1} 4x - 3y &= 12 \\ \textcircled{2} 3x - 15 - 2y - 6 &= -10 \\ \hline \textcircled{1} (4x - 3y) &= 12 \cdot 2 \\ \textcircled{2} (3x - 2y) &= 11 \cdot 3 \\ \hline \textcircled{1} 8x - 6y &= 24 \\ \textcircled{2} 9x - 6y &= 33 \\ \hline -x &= -9 \\ x &= 9 \\ 4(9) - 3y &= 12 \\ 36 - 12 &= 3y \\ 24 &= 3y \\ 8 &= y \\ \therefore \text{POI is } (9, 8) \end{aligned}$$

8. Expand and simplify.

$$\begin{aligned} \text{a) } 3(x + 8)(2x - 5) \\ &= 3(2x^2 - 5x + 16x - 40) \\ &= 3(2x^2 + 11x - 40) \\ &= 6x^2 + 33x - 120 \end{aligned}$$

$$\begin{aligned} \text{b) } (4x + 7)^2 &= (4x + 7)(4x + 7) \\ &= 16x^2 + 56x + 49 \end{aligned}$$

15. Graph $y = x^2$ in pencil and $y = -2(x - 3)^2 + 4$ in colour. List the transformations using proper mathematical language.

16. Solve.

$$\text{a) } 3x + 4 = -5$$

$$\begin{aligned} 3x &= -9 \\ 3x &= -9 \\ x &= -3 \end{aligned}$$

$$\text{d) } \frac{3}{x} \times \frac{7}{11} \quad \text{Cross mult.}$$

$$\begin{aligned} \frac{33}{7} &= \frac{7x}{7} \\ 4.7 &= x \end{aligned}$$

$$\text{b) } \frac{x+4}{2} = \frac{12}{1}$$

$$\begin{aligned} x+4 &= 24 \\ x &= 20 \end{aligned}$$

$$\text{e) } 3(x+3) = 5(x+2) + 1$$

$$\begin{aligned} 3x+9 &= 5x+10+1 \\ 9-11 &= 5x-3x \\ -2 &= 2x \\ -1 &= x \end{aligned}$$

$$\text{c) } \frac{x}{3} = \frac{4}{5}$$

$$5x = 12$$

$$x = 2.4$$

$$\text{f) } \left(\frac{r+5}{4} + \frac{r-2}{3} = 7 \right) \quad \text{L.C.D is 12}$$

$$12 \cdot \frac{(r+5)}{4} + 12 \cdot \frac{(r-2)}{3} = 7 \cdot 12$$

$$3(r+5) + 4(r-2) = 84$$

$$3r+15+4r-8=84$$

$$7r = 84-7$$

$$7r = 77$$

$$r = 11$$