Math Placement Sample

Question 1: (1 points)

$\frac{2x}{x^2-16} - \frac{1}{x-4} =$

- $\frac{2x-1}{x^2-16}$
- $\frac{1}{x-4}$
- $x-4$
- $\frac{2x-1}{x^2-x-12}$
- (selected) $\frac{1}{x+4}$

$$\textit{Factor}: \; x^2 - 16 \;\; \textit{into} \; (x-4)(x+4)$$

$$\textit{Rewrite}: \; \frac{2x}{(x-4)(x+4)} - \frac{1}{(x-4)}$$

$$\textit{Find LCD}: \; (x-4)(x+4)$$

$$\textit{Multiple}: \; \frac{2x}{(x-4)(x+4)} - \frac{1\,(x+4)}{(x-4)(x+4)}$$

$$\textit{Reduce}: \; \frac{2x-x-4}{(x-4)(x+4)} = \frac{\cancel{(x-4)}\,1}{\cancel{(x-4)}\,1(x+4)}$$

$$\textit{Answer}: \; \frac{1}{x+4}$$

Question 2: (1 points)

$\frac{6}{\sqrt{10\,x}} =$

- $\frac{\sqrt{15\,x}}{5\,x}$
- $\frac{3\sqrt{5\,x}}{5\,x}$
- (selected) $\frac{3\sqrt{10\,x}}{5\,x}$
- $\frac{\sqrt{5\,x}}{3}$
- $\frac{\sqrt{10\,x}}{6}$

$$\textit{Rationalize} \; \frac{6}{\sqrt{10x}} * \frac{\sqrt{10x}}{\sqrt{10x}} = \frac{6\sqrt{10x}}{\sqrt{100x^2}}$$

$$\textit{Reduce 6 and 10}: \; \frac{3\;\cancel{6}\sqrt{10x}}{5\;\cancel{10}x}$$

$$\textit{Answer}: \; \frac{3\sqrt{10x}}{5x}$$

Question 3: (1 points)
If $3x + 2 = 5y + 4$ then $y =$

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

$$3x + 2 = 5y + 4$$
$$-4 \qquad -4$$
$$3x - 2 = 5y$$

Divide by 5: $\frac{3x-2}{5} = \frac{5y}{5}$

Answer: $\frac{3x-2}{5} = y$

Question 4: (1 points)

The positive root of the equation $x^2 + 10 = 29$ lies between

- (selected) 4 and 5
- 9 and 10
- 6 and 7
- 1 and 3
- 5 and 6

$$x^2 + 10 = 29$$
$$-10 \quad -10$$
$$x^2 = 19$$

Take the Square of both sides: $\sqrt{x^2} = \pm\sqrt{19}$

$x = \pm\sqrt{19}$

For positive Root: $x = \sqrt{19}$

Estimate $\sqrt{16} \quad \sqrt{19} \quad \sqrt{25}$

$4 \quad \sqrt{19} \quad 5$

Answer: $\sqrt{19}$ *is between* 4 *and* 5

Question 5: (1 points)

Use Trial and Error to factor $(5x + 1)(7x - 3)$

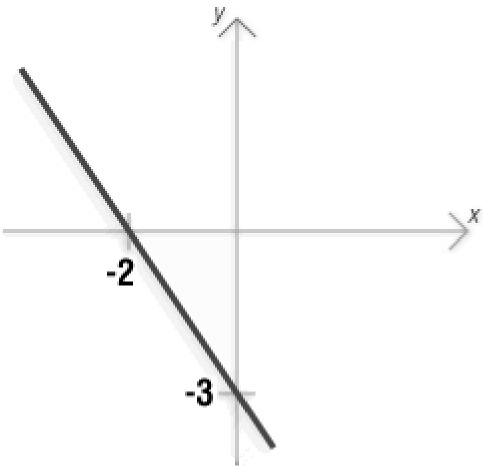
One of the factors of $35x^2 - 8x - 3$ is

- $7x + 1$
- (selected) $7x - 3$
- $7x + 3$
- $35x - 1$
- $5x - 1$

Question 6: (1 points)

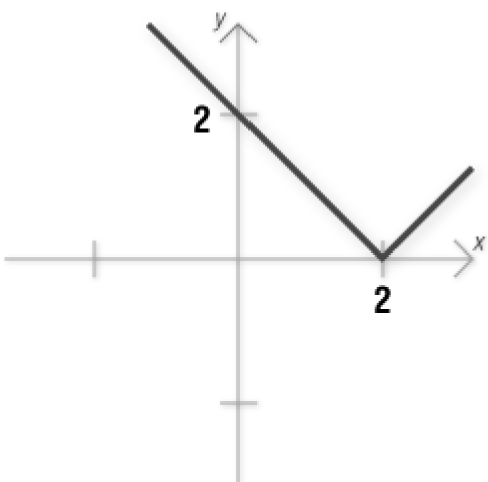
Graph the equation $-3x - 2y = 6$

X	Y
0	**-3**
-2	**0**



Question 7: (1 points)

Graph $y = |x - 2|$



X	Y
-2	4
-1	3
0	**2**
1	1
2	**0**

Question 8: (1 points)

If $f(x) = x^2 - kx - 1$ and $f(2) = -5$, then $k=$

- ○ -5
- ○ -4
- ○ 2
- ◉ 4
- ○ 1

$$f(2) = 2^2 - k(2) - 1$$
$$-5 = 4 - 2k - 1$$
$$-5 = 3 - 2k$$
$$-3 \qquad -3$$
$$\frac{-8}{-2} = \frac{-2k}{-2}$$
$$4 = k$$

Question 9: (1 points)

$$\frac{1}{1+\sqrt{5}} =$$

- ○ $\frac{1+\sqrt{5}}{4}$
- ○ $-\frac{1+\sqrt{5}}{24}$
- ◉ $\frac{-1+\sqrt{5}}{4}$
- ○ $\frac{-1+\sqrt{5}}{24}$
- ○ $\frac{1-\sqrt{5}}{4}$

$$\textit{Rationalize}: \frac{1}{1+\sqrt{5}} * \frac{1-\sqrt{5}}{1-\sqrt{5}}$$
$$\textit{Foil the denominator}: \frac{1-\sqrt{5}}{1-\cancel{\sqrt{5}+\sqrt{5}}-\sqrt{25}}$$
$$\frac{1-\sqrt{5}}{1-5} =$$
$$\frac{1-\sqrt{5}}{-4} \quad OR \quad -\frac{1-\sqrt{5}}{4} \quad OR \quad \frac{-1+\sqrt{5}}{4}$$

Question 10: (1 points)

If, for all values of x, $(x-k)^2 = k^2 + 2x + x^2$, then $k=$

- ○ -2
- ○ 1
- ○ 0
- ○ 2
- ◉ -1

$$(x-k)(x-k) = k^2 + 2x + x^2$$
$$x^2 - xk - kx + k^2 = k^2 + 2x + x^2$$
$$x^2 - 2xk + k^2 = k^2 + 2x + x^2$$
$$-x^2 - 2x - k^2 \quad -k^2 - 2x - x^2$$
$$-2xk - 2x = 0$$
$$-2x(k+1) = 0$$
$$k + 1 = 0$$
$$-1 \quad -1$$
$$k = -1$$

Question 11: (1 points)

If $f(x) = x^2 + 1$ and $h(x) = 4x + 2$, then $f(h(3)) =$

- ☐ 10
- ☐ 140
- ☐ 42
- ☐ 15
- ☒ 197

$$\boldsymbol{Find\ h(3) = 4(3) + 2 = 14}$$
$$\boldsymbol{f(h(3)) = f(14) = 14^2 + 1}$$
$$\boldsymbol{f(14) = 196 + 1}$$
$$\boldsymbol{f(14) = 197}$$

Question 12: (1 points)

The graph of the system of equations $\begin{cases} x - 2y = 1 \\ 3x + 6y = 3 \end{cases}$ consists of

$$\boldsymbol{Use\ addition\ elimination\ method:\ 3(x - 2y = 1)}$$
$$\boldsymbol{3x + 6y = 3}$$
$$\downarrow$$
$$\boldsymbol{3x - 6y = 3}$$
$$\underline{\boldsymbol{3x + 6y = 3}}$$
$$\boldsymbol{\frac{6x}{6} = \frac{6}{6}}$$
$$\boldsymbol{x = 1}$$
$$\boldsymbol{x - 2y = 1}$$
$$\boldsymbol{1 - 2y = 1}$$
$$\underline{\boldsymbol{-1 \qquad -1}}$$
$$\boldsymbol{\frac{-2y}{-2} = \frac{0}{-2}}$$
$$\boldsymbol{y = 0}$$
$$\boldsymbol{Intersect\ at\ x = 1, y = 0}$$

- ☐ two lines intersecting where $y = 3$.
- ☐ one line.
- ☐ two distinct parallel lines.
- ☐ two lines intersecting where $x = 3$.
- ☒ two lines intersecting where $x = 1$.

Question 13: (1 points)

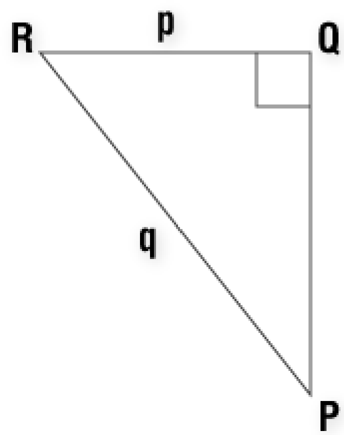
If $\log_{10} x = 3$, then $x =$

- (selected) 1,000
- $\frac{1}{1,000}$
- 100
- 10
- $\frac{3}{10}$

$$log_{10}\ x = 3$$
$$Use\ log_b\ x = y$$
$$x = b^y$$
$$x = 10^3$$
$$x = 1000$$

Question 14: (1 points)

In the figure shown below, if $\sin(P) = 0.37$ and $p = 4$, then $q =$



- $4(0.37)$
- $\frac{4}{5}$
- (selected) $\frac{4}{0.37}$
- 5
- Insufficient information is given to solve this problem.

$$Sin\ P = \frac{opposite}{hypotenuse}$$

$$Sin\ P = \frac{p}{q}$$

$$\frac{0.37}{1} = \frac{4}{q}$$

$$0.37\ q = 4$$

$$\frac{0.37q}{0.37} = \frac{4}{0.37}$$

$$q = \frac{4}{0.37}$$

Question 15: (1 points)

Use Identity: $\boldsymbol{sin\,(90^0 - \theta) = Cos\ \theta}$

$\sin(90^o - \theta) =$

- ☐ $\sin(\theta)$
- ☒ $\cos(\theta)$
- ☐ $-\sin(\theta)$
- ☐ $1+\cos(\theta)$
- ☐ $-\cos(\theta)$

Question 16: (1 points)

For all real numbers x, $\cos^2(4x) + \sin^2(4x) =$

- ☒ 1
- ☐ 0
- ☐ $\sin(8x)$
- ☐ 4
- ☐ $\cos(8x)$

Use identity: $\boldsymbol{Sin^2 A + Cos^2 A = 1}$

$\boldsymbol{A = 4x}$

$\boldsymbol{Cos^2\,4x + Sin^2 4x = 1}$

Question 17: (1 points)

For which value(s) of x in the interval $0 \le x \le 2\pi$ does $(\cos(x) - 1)(\cos(x) - 3) = 0$?

- ☐ 1 and 3
- ☐ $\frac{\pi}{2}$
- ☐ π
- ☒ 0 and 2π
- ☐ $\frac{\pi}{2}$ and $\frac{3\pi}{2}$

Set each factor to zero

$$\begin{array}{rr} Cos\ x - 1 = 0 & Cos\ x - 3 = 0 \\ +1 \quad +1 & +3 \quad +3 \\ \hline Cosx = 1 & Cos\ x = 3 \end{array}$$

$\boldsymbol{Cos\ x = 1\ at\ x = 0^0\ and\ 2\pi}$

$\boldsymbol{Cos\ X = 3\ is\ not\ possible\ because}$

$\boldsymbol{-1 < cos\ x \le 1}$

Answer: $\{0, 2\pi\}$

Question 18: (1 points)

Recall that for the triangle ABC the law of cosines states that $a^2 = b^2 + c^2 - 2\ bc\cos(A)$ where a is the length of the side opposite angle A, b is the length of the side opposite angle B, and c is the length of the side opposite angle C.
In the triangle shown in the figure below, what is $\cos(P)$?
Note: The figure is not drawn to scale.

$$\textbf{Looking for } P: \qquad p^2 = q^2 + r^2 - 2qr\cos P$$

$$P = 4 \quad Q = 5 \quad R = 8$$

$$4^2 = 5^2 + 8^2 - 2(5)(8)\ \cos P$$

$$16 = 25 + 64 - 80\ \cos P$$

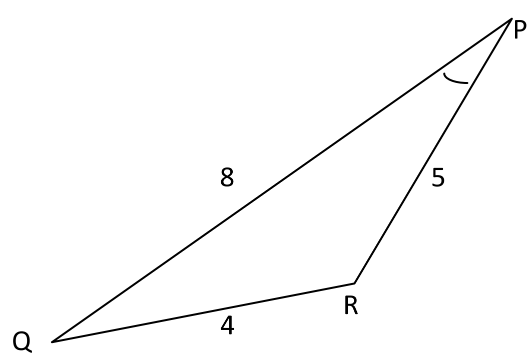
$$16 = 89 - 80\ \cos P$$

$$-89 \qquad -89$$

$$\frac{-73}{-80} = \frac{-80}{-80}\ \cos P$$

$$\cos P = \frac{73}{80}$$

- ○ $\frac{55}{64}$
- ○ $\frac{5}{8}$
- ○ $\frac{4}{5}$
- ● $\frac{73}{80}$
- ○ $\frac{23}{40}$



Question 19: (1 points)

If $f(x) = -2^x + x^2$, then $f(-1) =$

- ☐ 3
- ☒ $\frac{1}{2}$
- ☐ $-\frac{3}{2}$
- ☐ $-\frac{1}{2}$
- ☐ $\frac{3}{2}$

$$\boldsymbol{Replace\ x\ with -1}$$
$$\boldsymbol{f(-1) = -2^{-1} + (-1)^2}$$
$$\boldsymbol{f(-1) = -\frac{1}{2} + 1}$$
$$\boldsymbol{f(-1) = -\frac{1}{2} + \frac{2}{2}}$$
$$\boldsymbol{f(-1) = \frac{1}{2}}$$

Question 20: (1 points)

$\log_5\left(\frac{1}{25}\right) =$

$$\boldsymbol{Use\ log_b\, x = y}$$
$$\boldsymbol{x = b^y}$$
$$\boldsymbol{log_5\left(\frac{1}{25}\right) = y}$$
$$\boldsymbol{\frac{1}{25} = 5^y}$$
$$\boldsymbol{\frac{1}{5^2} = 5^y}$$
$$\boldsymbol{5^{-2} = 5^y}$$
$$\boldsymbol{-2 = y}$$

- ☐ 5
- ☒ -2
- ☐ 2
- ☐ -5
- ☐ $\frac{1}{2}$