MCR 3U1-2021-Quad 3 **CPT- PART 2**

Write both numbers here: **p _____, q _____**

1. *An exponential function $y = (3)^x$ is reflected in the y-axis, vertically stretched by **a factor of q,** shifted 4 units to the left and shifted downward **p** units.

   a) Write the equation of the transformed function.
   b) State the y-intercept. If decimal, give accurate to the nearest 100^{th}. Show how you got it.

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2. *A bacteria culture, with 20 bacteria cells at the start of the experiment, doubles in size every p minutes.
   a) Write an equation to model the bacteria count as a function of time.
   b) How many bacteria are there after 1h and 15 min?
   c) How long, how many hours and minutes) will it take for a culture of 20 bacteria to grow to a population of 163 840?

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3. Simplify the following expression. Show all steps. Leave the answer with positive exponents.

$(64a^8b^4)^{\frac{1}{2}} \div (16a^{12}b^{-4})^{\frac{5}{4}}$

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4. *Point $P(p, -q)$ is on the terminal arm of the angleθ in standard position. $0^{\circ} \leq \theta \leq 360^{\circ}$.
   a) Sketch θ, and then determine the related acute angle.
   b) Find **the exact value** of secant θ and cotangent θ.
   c) Find the measure of θ accurate to the nearest tenth.

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5. *The range of the sinusoidal function below is $q \leq y \leq p$.

   a) Determine two equations of the graph (as sine and cosine).
   b) Use the equation to find $f(127)$
   c) For what values of x, during the first cycle, is $f(x) = 10$? Show work.

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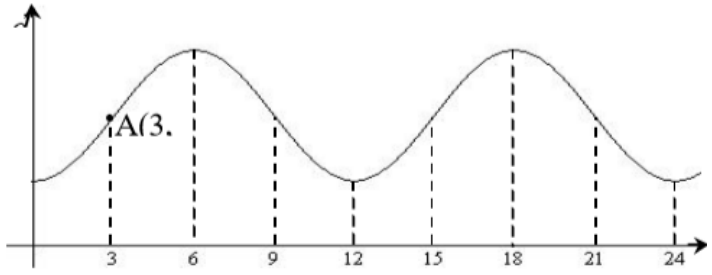

6. Sketch **one cycle** for $y = -3\,sin\,2\,(\theta + 60°) - 1$ Using 5-point method. Make sure to draw a nice, smooth curve. Indicate the domain and range of the graph you draw (one cycle) . Label the x axis in terms of degrees, using the appropriate points.

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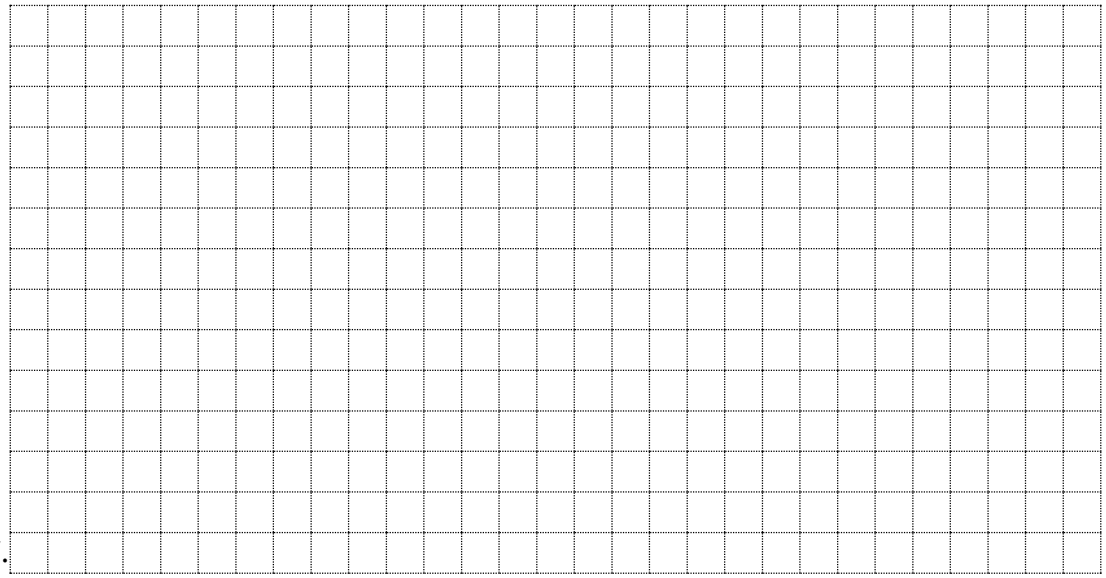

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9. *A wheel has a diameter of q metres and takes 100 seconds to make a full rotation. The lowest point on the wheel is 2 m above the around. A nail in the wheel is at its highest point when the wheel starts rotating.

   a) Determine an equation of a sinusoidal function to model the height as a function of time.
   b) Determine the nail's height at 35 seconds.
   c) What is the total distance that the nail traveled when the wheel rotated 270°?

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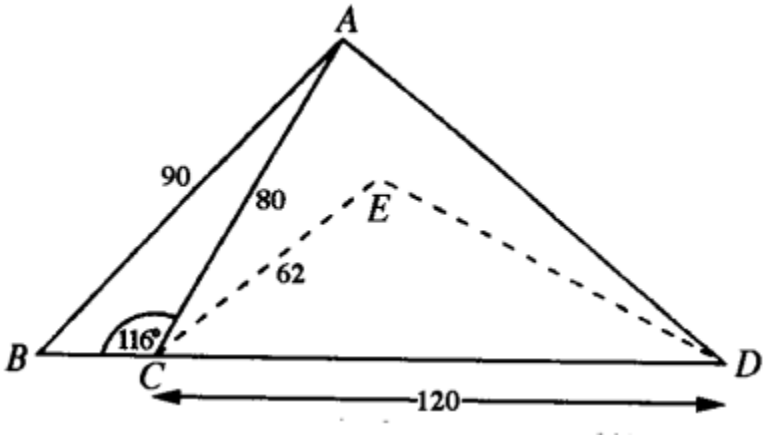
10. In the diagram BCD is a straight line. AB = 90 m, AC = 80 m, CD = 120 m and . 0 ∠ = BCA 116

a) Calculate ∠BAC and AD, both to one decimal place.



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b) The point E, inside triangle ACD, is such that CE = 62 m and the area of triangle CDE is 2200 m2 . Calculate ∠ECD , both to one decimal place.