Parent Signature: ______________________ Current Course Mark: 100%

Unit 1 Assessment #2
Chapter 2: Analytic Geometry – Line Segments and Circles

AG

34 /34 (100%)

$M = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$	$d^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$	$m = \frac{y_2-y_1}{x_2-x_1}$	$y = mx + b$
$x^2 + y^2 = r^2$	$C = 2\pi r$	$A = \frac{bh}{2}$	

Instructions and Hints:

1. You must show full solutions! Please make sure that they are organized and legible (equals signs, neat handwriting, appropriate symbols and conventions, etc.). If I cannot follow them, I cannot mark them.
2. Please show your process clearly. Whether you are using a graph or algebra, I need to be able to see where your answer came from!!
3. Double-check your work! No more sign errors!!! Use a fraction button if you aren't sure about your fractions!
4. Report your answers as exact values (keep the square root symbol, leave them as fractions) unless you are using them to complete more calculations (perimeter, area, etc.).
5. **You had the option to create a cheat sheet. If you are using one, you MUST hand it in with your test!**

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1. State the coordinates of the midpoint of the line segment from A(-3, -7) to B(5, 11). (1 mark)

$M_{AB} = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

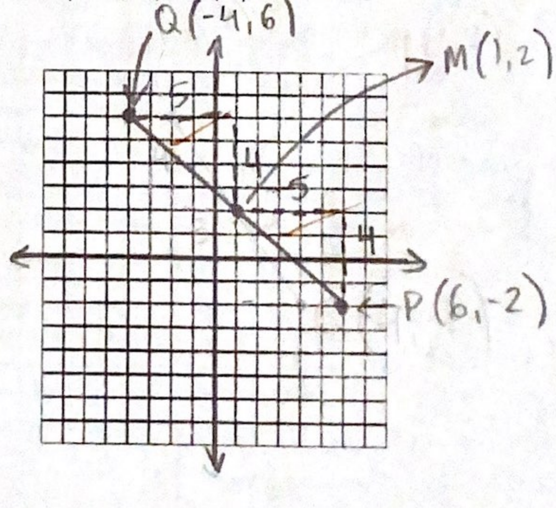
$M_{AB} = \left(\frac{-3+5}{2}, \frac{-7+11}{2}\right)$

$M_{AB} = (1, 2)$

∴ the midpoint of AB is (1, 2).

1

2. Line segment PQ has one end point, P, at (6, -2) and a midpoint, M, at (1, 2). Determine the coordinates of Q. (2 marks)



∴ the coordinates of Q, the other endpoint, are (-4, 6).

2

3. Triangle JKL has vertices J(-2, 5), K(5, -1) and L(-4, 1). Determine:

a. The perimeter of the triangle. (4 marks) Round your final answer to one decimal place.

Side JK:

$d^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$

$d^2 = (5-(-2))^2 + (-1-5)^2$

$d^2 = 49 + 36$

$d = \sqrt{85}$ units

4

Side KL:

$d^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$

$d^2 = (-4-5)^2 + (1-(-1))^2$

$d^2 = 81 + 4$

$d = \sqrt{85}$ units

Side LJ:

$d^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$

$d^2 = (-2-(-4))^2 + (5-1)^2$

$d^2 = 4 + 16$

$d = \sqrt{20}$ units

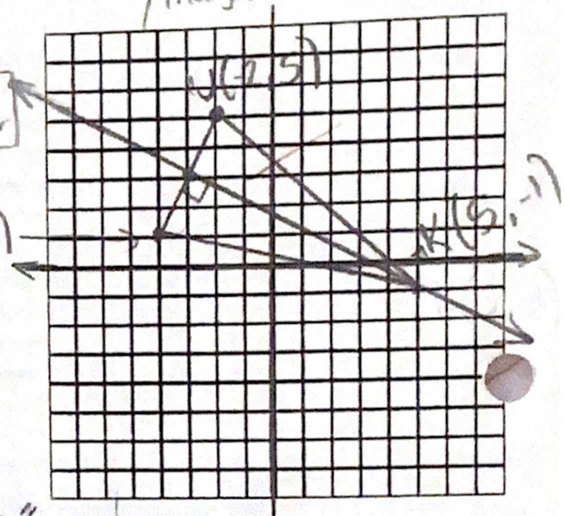
$P = S_1 + S_2 + S_3$

$P = \sqrt{85} + \sqrt{85} + \sqrt{20}$

$\boxed{P = 22.9 \text{ units}}$

∴ the perimeter of triangle JKL is 22.9 units

b. The equation of the perpendicular bisector of side JL. (4 marks)



$M_{JL} = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$M_{JL} = \left(\frac{-2+(-4)}{2}, \frac{5+1}{2}\right)$

$M_{JL} = (-3, 3) \longrightarrow b = y_1 - mx_1$

$b = 3 - \left(\frac{-1}{2}\right)(-3)$

$b = 3 - \frac{3}{2}$

$b = \frac{6}{2} - \frac{3}{2}$

$\boxed{b = \frac{3}{2}}$

$y = \frac{-1}{2}x + \frac{3}{2}$

$m_{JL} = \frac{y_2 - y_1}{x_2 - x_1}$

$m_{JL} = \frac{1-5}{-4-(-2)}$

$m_{JL} = \frac{-4}{-2}$

$\boxed{m_{JL} = 2}$

$\boxed{\therefore m_{JL} \perp = \frac{-1}{2}}$

4

∴ the equation of the perpendicular bisector of side JL is "$y = \frac{-1}{2}x + \frac{3}{2}$".

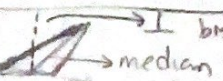
Choose either question #4 OR #5. Your answer should fit on this page! (4 marks)

4. Clearly define the term <u>median</u> as it pertains to triangles and explain how you would find the <u>equation of a median</u>. What is the difference between a perpendicular bisector and a median in a triangle?

4

5. Define <u>right isosceles</u> triangle. Explain how you would prove that a triangle is a <u>right isosceles</u> triangle if you are given the coordinates of its vertices.

The median in triangles is a line segment that connects one vertex to the midpoint of the opposite side. To find the equation of a median, you have to first find the midpoint of the side being bisected (split in half). Then, you use that midpoint and the opposite vertex (to which the median is connected to) to find the slope of the median (using $\frac{y_2-y_1}{x_2-x_1}$). Lastly, you use the slope and either of the points you just used (either midpoint of bisected side or opposite vertex). You sub those into "y = mx+b" and solve for b. Then, to write the equation, you put it in "y = mx+b" form, replacing m with the slope you found and b with the y-intercept you found. The difference between a perpendicular bisector and a median is that a ⊥ bisector bisects a line segment at 90°, while a median joins the midpoint of one side to the opposite vertex. ∴ medians don't necessarily have to bisect a line at 90° while perpendicular bisectors do.

Ex: 

$m \perp y = -2x+3$" $= \boxed{\frac{1}{2}}$

6. Determine the exact distance from the point A(-3, -6) to the line $y = -2x + 3$. (5 marks)

Points:
- A(-3, -6)
- P(3, -3)

$d^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$

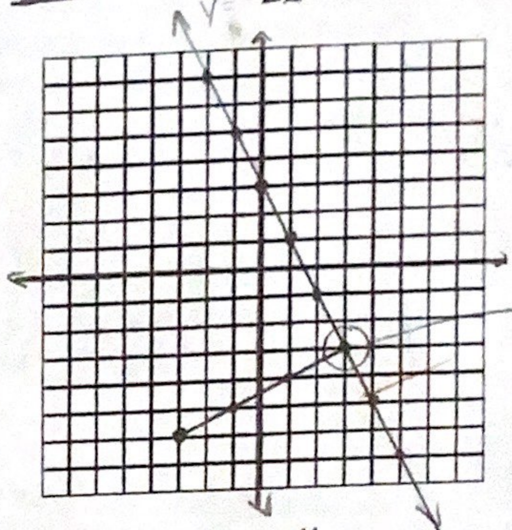
$d^2 = (3-(-3))^2 + (-3-(-6))^2$

$d^2 = 36 + 9$

$d = \sqrt{45}$ units

∴ The exact distance from point A to the line "$y = -2x+3$" is $\sqrt{45}$ units.

5



7. Write the equation of a circle centered at the origin that has a radius of $\frac{11}{3}$. (1 mark)

1

$x^2 + y^2 = \left(\frac{11}{3}\right)^2 \rightarrow x^2 + y^2 = \frac{121}{9}$

8. Write the equation for a circle centered at the origin that passes through A(-6 , 2). State the exact value of the radius and coordinates of the x and y-intercepts. (3 marks)

$x^2 + y^2 = r^2$

$(-6)^2 + 2^2 = r^2$

$36 + 4 = r^2$

$\boxed{40 = r^2}$

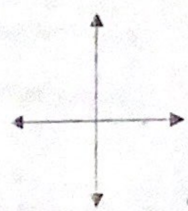
$\boxed{\sqrt{40} = r}$

$x^2 + y^2 = 40$

3

X-ints:
- $(\sqrt{40}, 0)$
- $(-\sqrt{40}, 0)$

Y-ints:
- $(0, \sqrt{40})$
- $(0, -\sqrt{40})$



∴ the radius is $\sqrt{40}$ units.

∴ the equation is "$x^2 + y^2 = 40$".

∴ the x and y-ints are $(\sqrt{40}, 0)$, $(-\sqrt{40}, 0)$, $(0, \sqrt{40})$, and $(0, -\sqrt{40})$

9. A quadrilateral has vertices at A(3, 6), B (-3, 2), C(-1, -1), and D(5, 3). Show that the shape is a rectangle. (5 marks)

Diagonals:
- should be equal length
- should not be perpendicular

$d_{AC}^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$

$d_{AC}^2 = (-1-3)^2 + (-1-6)^2$

$d_{AC}^2 = 16 + 49$

$d_{AC} = \sqrt{65}$ units

$m_{AC} = \frac{y_2 - y_1}{x_2 - x_1}$

$m_{AC} = \frac{-1-6}{-1-3}$

$m_{AC} = \frac{-7}{-4}$

$\boxed{m_{AC} = \frac{7}{4}}$

$d_{BD}^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$

$d_{BD}^2 = (5-(-3))^2 + (3-2)^2$

$d_{BD}^2 = 64 + 1$

$d_{BD} = \sqrt{65}$ units

$m_{BD} = \frac{y_2 - y_1}{x_2 - x_1}$

$m_{BD} = \frac{3-2}{5-(-3)}$

$\boxed{m_{BD} = \frac{1}{8}}$

Since $\frac{1}{8}$ and $\frac{7}{4}$ aren't negative reciprocals, the diagonals aren't $\perp$.

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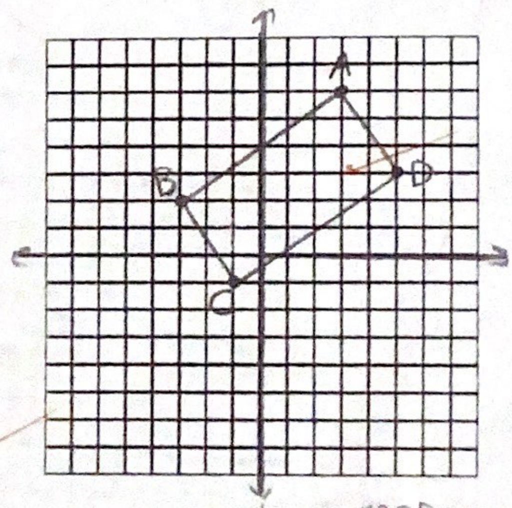
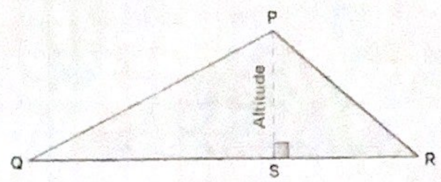


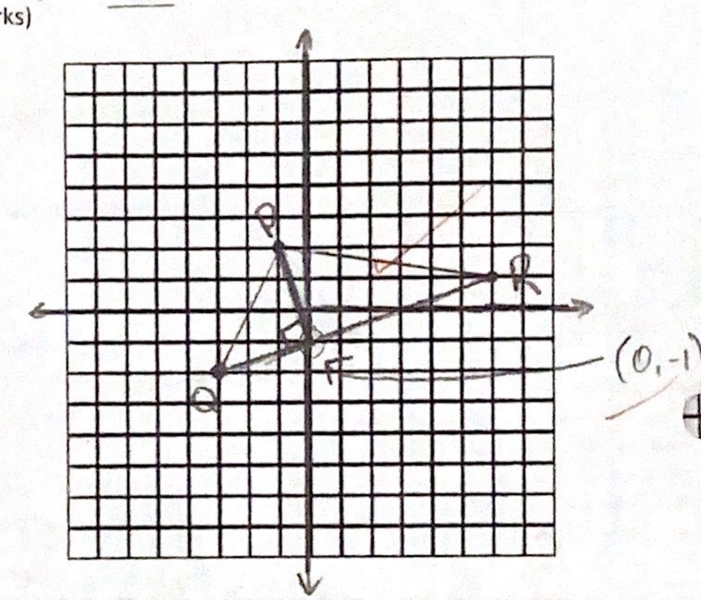
∴ Quadrilateral ABCD is a rectangle.

10. An altitude in a triangle is also the height of a triangle. The altitude joins the vertex to the opposite side at an angle of 90 degrees (see diagram).



The altitude DOES NOT BISECT the opposite side!!

a. Draw ΔPQR, where P(-1, 2), Q(-3, -2), and R(6, 1). Use your diagram to accurately draw the altitude from P. (2 marks)



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b. Calculate the length of the altitude. (1 mark)

$d^2 = (x_2-x_1)^2 + (y_2-y_1)^2$

$d^2 = (0-(-1))^2 + (-1-2)^2$

$d^2 = 1+9$

$d = \sqrt{10}$ units

· (0, -1)

· P(-1, 2)

∴ the length of the altitude is $\sqrt{10}$ units.

1

c. Calculate the length of line segment QR. (1 mark)

$d_{QR}^2 = (x_2-x_1)^2 + (y_2-y_1)^2$

$d_{QR}^2 = (6-(-3))^2 + (1-(-2))^2$

$d_{QR}^2 = 81+9$

$d_{QR} = \sqrt{90}$ units

∴ the length of line segment QR is $\sqrt{90}$ units.

d. Find the area of the triangle. (1 mark)

$A = \frac{bh}{2}$

$A = \frac{(\sqrt{90})(\sqrt{10})}{2}$

$A = \frac{30 \text{ units}^2}{2}$

$\boxed{A = 15 \text{ units}^2}$

∴ the area of the triangle is 15 units².

1