

MPM2D – Exam Review – Units 6 and 7

Unit 6 – Linear Systems

1. Solve the following systems of linear equations by an algebraic method of your choice.

a.
$$\begin{aligned} 3x + y &= 5 \\ x - 2y &= 11 \end{aligned}$$

b.
$$\begin{aligned} 3x - 2y &= -8 \\ -9x + 3y &= 21 \end{aligned}$$

c.
$$\begin{aligned} 2x - 3y &= 10 \\ 3x - 4y &= 8 \end{aligned}$$

d.
$$\begin{aligned} 6x - 3y &= 4 \\ 5x - 5y &= 10 \end{aligned}$$

e.
$$\begin{aligned} y &= 2x - 30 \\ \frac{1}{5}x - \frac{1}{2}y &= -1 \end{aligned}$$

f.
$$\begin{aligned} \frac{1}{3}x - \frac{1}{2}y &= -\frac{5}{6} \\ \frac{1}{5}x - \frac{1}{3}y &= -\frac{3}{5} \end{aligned}$$

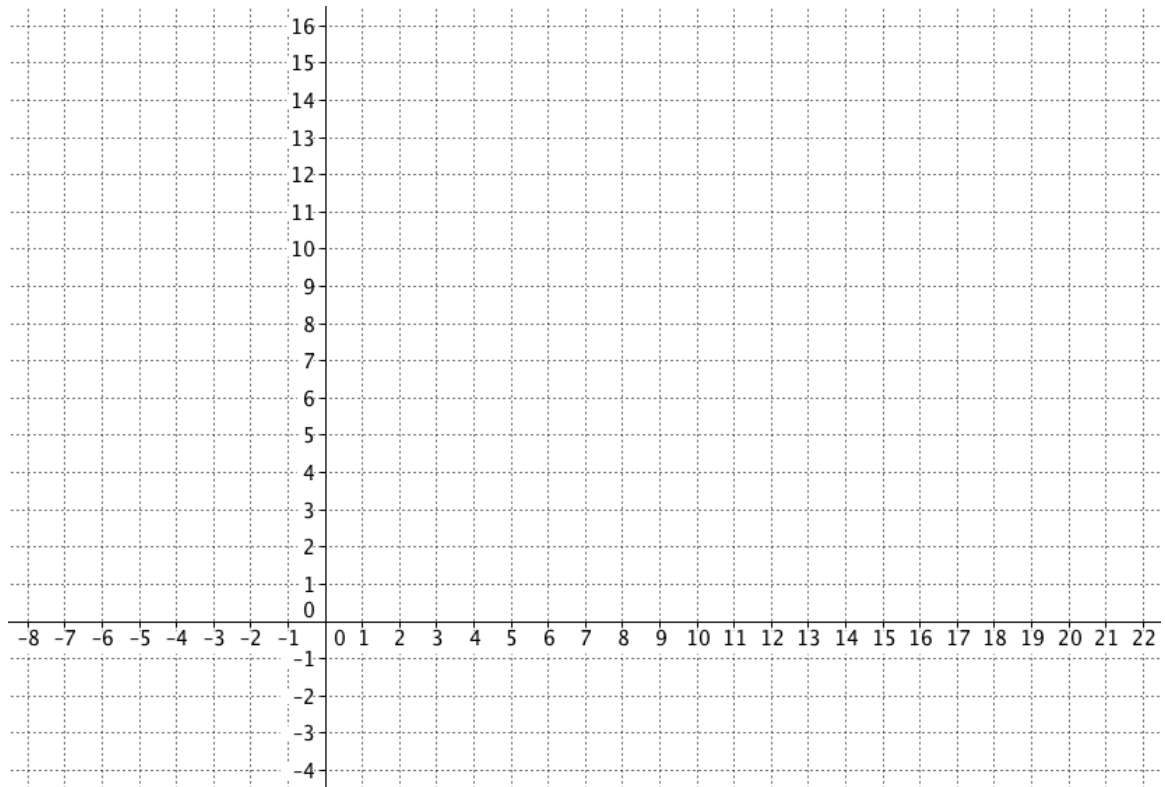
2. Quentin is a cashier at a grocery store. He has a total of \$580 in bills. He has 76 bills in total consisting of \$5 and \$10 bills. How many of each type does he have?
3. Premium gasoline sells for 78.9 ¢/L and regular gasoline sells for 71.9 ¢/L. To boost sales, a middle octane gasoline is formed by mixing premium and regular. If 1000 L of this middle octane gas is produced and is sold at 76.1 ¢/L, then how much of each type of gasoline could you assume was used in the mixture?
4. Marika, a lab technician, needs three litres of an 8% saline solution. She has a 5% saline solution and a 9% saline solution in the lab stock room. How many litres of the 5% and 9% solution should she mix together?
5. Troy and Gabriella are selling pies for a school fundraiser. Customers can buy apple pies and lemon meringue pies. Troy sold 6 apple pies and 4 lemon meringue pies for a total of \$80. Gabriella sold 6 apple pies and 5 lemon meringue pies for a total of \$94. What is the cost of each pie?
6. The senior classes at High School A and High School B planned separate trips to New York City. The senior class at High School A rented and filled 16 vans and 5 buses with 417 students. High School B rented and filled 10 vans and 8 buses with 480 students. Every van held the same number of students as did each bus. How many students can a van carry? How many students can a bus carry?
7. A farmer has two types of milk, one that is 24% butterfat and another that is 18% butterfat. How much of each should he use to end up with 42 gallons of milk that is 20% butterfat?

8. How many pounds of almonds that cost \$4.20 per pound must be mixed with 12 lbs of walnuts that cost \$2.25 per pound to make a mixture that costs \$3.40 per pound?
9. A grocery store offers a cheese and fruit sampler that combines cheddar cheese that costs \$8 per kilogram with kiwis that cost \$3 per kilogram. How many kilograms of each were used to make a 5 kg mixture that costs \$4.50 per kilogram?

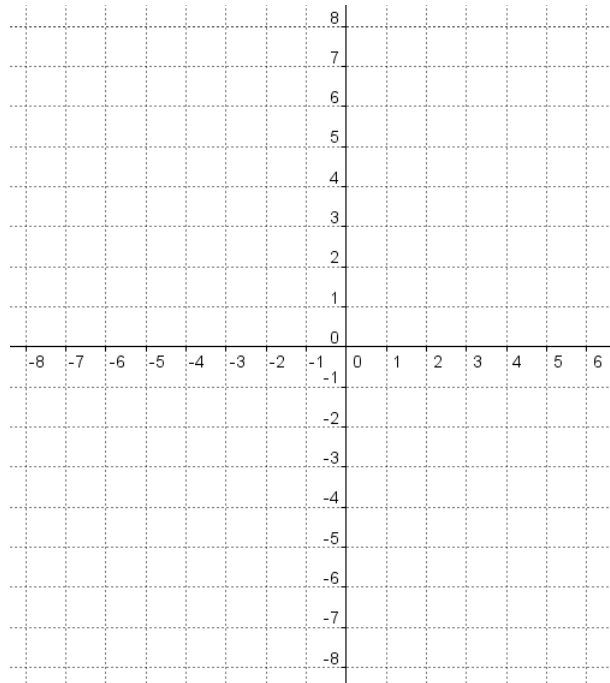
Unit 7 – Analytic Geometry

1. Given A(4, 3) and B(-2, 7), find:
 - a. The midpoint of AB
 - b. The length of AB
 - c. The slope of AB
 - d. The equation of the line passing through AB
2. Given A (-1, -2) and B (-7, 10) find:
 - a. The midpoint of AB
 - b. The length of AB
 - c. The slope of AB
 - d. The equation of the line passing through AB
3. Determine the length of the line segment joining each pair of points. Express each length as an exact answer.
 - a. A (2, 1) and B (3, 5)
 - b. C (3, -5) and D (-6, 7)
4. Determine the midpoint of each line segment from the given endpoints.
 - a. A (5, 7) and B (3, 9)
 - b. C $\left(\frac{1}{2}, \frac{5}{2}\right)$ and D $\left(\frac{3}{2}, -\frac{7}{2}\right)$
5. A line segment has endpoint C(5, -7) and midpoint M (3.5, 1.5). Determine the other endpoint.
6. A line segment has endpoint J (3, 5) and midpoint M (7, 10). Determine the other endpoint.
7. Explain how to determine if a point is inside or outside or on the circle given the point and the equation of the circle.
8. Determine whether each point below is inside or outside or on the circle with the given equation.
 - a. (3, 6) and $x^2 + y^2 = 49$.
 - b. (10, 5) and $x^2 + y^2 = 121$.

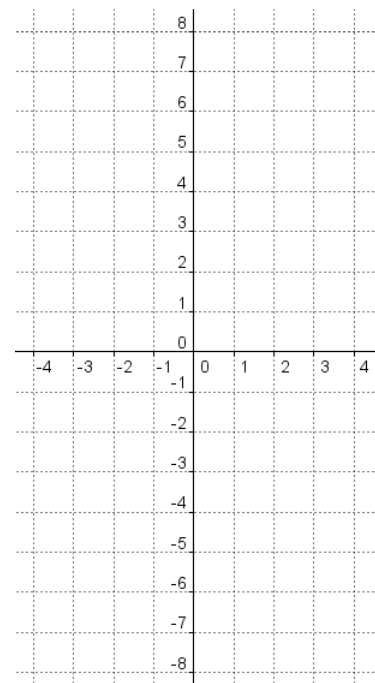
9. Triangle ABC has vertices A (3, 5), B (2, 3), and C (5, 2). Find the equation of the altitude from A to BC.
10. Find the shortest distance between the point (6, 5) and the line $7x + y + 23 = 0$.
11. Classify the following triangles as scalene or isosceles or equilateral.
- Triangle PQR with vertices at P (-1, 4), Q (8, 1), and R (1, -2).
 - Triangle KLM with vertices at K (2, 5), L (4, 1), and M (6, -3).
12. Determine the area of the trapezoid with vertices A (-8, -3), B (22, 3), C (9, 16), and D (-1, 14).



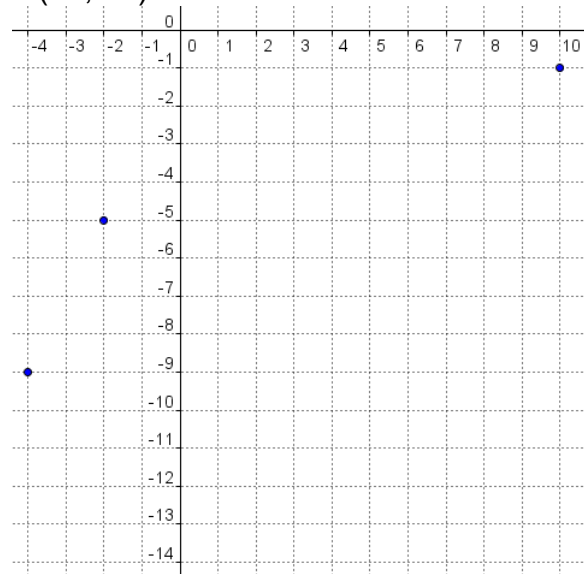
13. Determine the area of the triangle with vertices at P $(-8, 2)$, Q $(4, -7)$, and R $(6, 4)$.



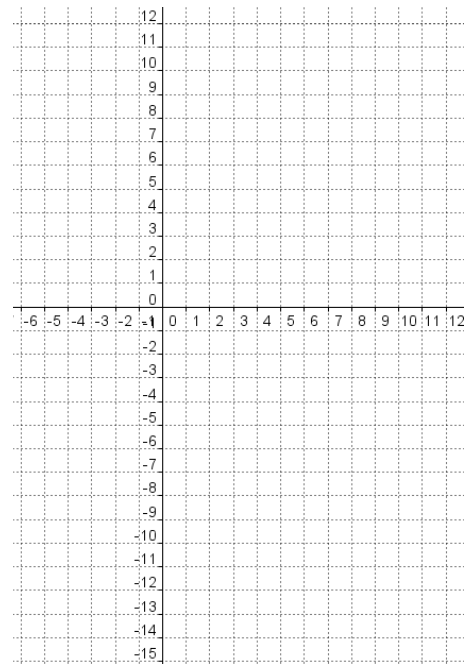
14. Determine the area of the triangle with vertices at A $(-3, 3)$, B $(4, 2)$, and C $(1, 1)$.



15. Given a quadrilateral with vertices at S (1, 2), T (3, 5), U (6, 7), and V (4, 4), verify that the quadrilateral is a parallelogram. Justify your answer.
16. Given a quadrilateral with vertices at A (1, 2), B (2, 5), C (5, 4), and D (4, 1), prove that the quadrilateral is a square. Justify your answer.
17. Given a quadrilateral with vertices at A (-1, 3), B (6, 4), C (4, -1), and D (-3, -2), determine if the quadrilateral is a parallelogram or trapezoid or square or rectangle.
18. Determine algebraically the centre of the circle that passes through the points G (-4, -9), H (-2, -5), and I (10, -1).



19. Determine algebraically the centre of the circle that passes through P (10, 9), Q (-2, 1), and R (-6, -15).



Answer Key

Unit 6

1a) POI (3, -4)

b) POI (-2, 1)

c) POI $\left(-16, -\frac{37}{3}\right)$

d) POI $\left(-\frac{2}{3}, -\frac{8}{3}\right)$

e) POI (20, 10)

f) POI (2, 3)

2) 36 \$5 bills and 40 \$10 bills

3) 600 L of 78.9¢/L and 400 L of 71.9¢/L

4) 0.75 L of 5% and 2.25 L of 9%

5) Apple Pie is \$4 and Lemon Pie is \$14

6) Van holds 12 students and a bus holds 45 students

7) 14 gallons of 24% butterfat milk and 28 gallons of 18% butterfat.

8) 17.25 lbs of almonds to make 29.25 lbs of the mixture.

9) 1.5 kg of cheese and 3.5 kg of kiwis.

Unit 7

1a) M (1, 5)

b) $L_{AB} = \sqrt{52} \text{ units}$

c) $m = -\frac{2}{3}$

d) $y = -\frac{2}{3}x + \frac{17}{3}$

2a) M (-4, 4)

b) $L_{AB} = \sqrt{180} \text{ units}$

c) $m = -2$

d) $y = -2x - 4$

3a) $L_{AB} = \sqrt{17} \text{ units}$

b) $L_{CD} = 15 \text{ units}$

4a) M (4, 8)

b) M (1, - $\frac{1}{2}$)

5a) D (2, 10)

6) K (11, 15)

7) See solutions

8a) inside circle

8b) outside circle

9) $y = 3x - 4$

10) $L = \sqrt{83.2} \text{ units}$

11a) Scalene

$L_{PQ} = \sqrt{89} \text{ units}$

$L_{QR} = \sqrt{58} \text{ units}$

$L_{PR} = \sqrt{40} \text{ units}$

11b) Isosceles

$L_{KL} = \sqrt{20} \text{ units}$

$L_{LM} = \sqrt{20} \text{ units}$

$L_{KM} = \sqrt{80} \text{ units}$

12) $A = 312 \text{ units}^2$

13) $A = 75 \text{ units}^2$

14) $A = 5 \text{ units}^2$

15) $m_{ST} = \frac{3}{2}$ $m_{TU} = \frac{2}{3}$ $m_{UV} = \frac{3}{2}$ $m_{SV} = \frac{2}{3}$

Opposite sides have parallel slopes and

therefore it's a parallelogram.

16) $m_{AB} = 3$ $m_{AC} = -\frac{1}{3}$ $L_{AB} = \sqrt{10} \text{ units}$ $L_{BC} = \sqrt{10} \text{ units}$ $L_{CD} = \sqrt{10} \text{ units}$ $L_{AD} = \sqrt{10} \text{ units}$

Two connected lines have perpendicular slopes and all four sides are the same length and therefore it is a square.

17) $m_{AB} = \frac{1}{7}$ $m_{BC} = \frac{5}{2}$ $m_{CD} = \frac{1}{7}$ $m_{AD} = \frac{5}{2}$

Opposite sides have parallel slopes. No

perpendicular slopes. Parallelogram.

18) Centre is (7, -12)

19) Centre is (15.2, -11.8)