MPM2D – Exam Review

Units 1 & 2 – Analytic Geometry

1. Solve the following linear systems algebraically by the method indicated:

a) elimination

i) $2x - 3y = -5$
$-2x + 7y = 17$

ii) $3y = -4x - 1$
$3x - 2y = -22$

b) substitution

i) $2x + y = 10$
$3x + 2y = 9$

ii) $2x + 3y = 0$
$x + y = 2$

2. Solve the following linear system graphically: $y = \frac{1}{3}x - 5$ and $2x + 3y = 3$

3. Circle the pair of lines which are parallel.

i) $3x + 4y = 13$ ii) $4x - 3y = 8$ iii) $y = -\frac{3}{4}x + 5$ iv) $y = -\frac{4}{3}x + 8$

4. Circle the pair of lines which are perpendicular.

i) $2x + y = 15$ ii) $2x + y = 5$ iii) $y = -\frac{1}{2}x - 3$ iv) $y = \frac{1}{2}x + 4$

5. How many solutions are there in each of the following linear systems?

i) $4x - 6y = 7$
$2x - 3y = 3$

ii) $3x - 2y = 5$
$9x - 6y = 15$

iii) $x + y = 3$
$x - y = 1$

6. The point (-3,5) is a solution to which of the following linear systems?

i) $x + y = 2$
$2x - y = -10$

ii) $x - y = -7$
$3x + 2y = 1$

iii) $-2x + 3y = 21$
$4x + 2y = -2$

7. Determine the distance and slope for each pair of points:

i) A(4,5) and B(-2,-3) ii) M(-1,7) and N(4,-2) iii) X(5,0) and Y(0,-12)

8. Describe what is meant by the words scalene, isosceles, and equilateral triangles.

9. Determine the lengths of the sides of the triangle with vertices A(0,0), B(4,3) and C(-4,3). What type of triangle is ΔABC?

10. Show that the triangle with vertices P(-2,-3), Q(4,1) and R(2,4) is a right triangle. Which of the vertices contains the right angle?

11. Define the terms quadrilateral, parallelogram, rhombus, rectangle and square.

12. Determine whether the quadrilateral with vertices A(0,10), B(10,90), C(170,70) and D(160,-10) is a parallelogram, rhombus, rectangle or square.

13. Determine the midpoint of the line segments with the given endpoints:

i) S(10,-5) and T(-4,7) ii) J(3,0) and K(6,8) iii) M(4.6,-2.9) and N(-2.4,1.5)

14. Determine the equation of the line with a slope of -2 and which goes through the point (3,-1).

15. Describe the terms median, altitude and perpendicular bisector.

16. A triangle has vertices at A(-1,3), B(7,5) and C(2,-3). Determine the equation of the median through vertex C.

17. A triangle has vertices at P(-4,-3), Q(5,-6) and R(4,1). Determine the equation of the altitude which goes through vertex R.

18. A triangle has vertices J(-2,-5), K(6,-1) and L(0,5). Determine the equation of the perpendicular bisector of side JK.

19. Describe the terms centroid, orthocentre and circumcentre.

20. Define the terms circle, radius and diameter.

21. A circle has a diameter with endpoints at (6,8) and (-6,-8). Determine the following:
    i) The coordinates of the centre of the circle
    ii) The length of the radius
    iii) The length of the diameter
    iv) The equation of the circle

22. Determine the equation of a circle centered at the origin and having a radius of 8 units.

23. What is the diameter of a circle with the equation $x^2 + y^2 = 49$?

24. The sum of two numbers is 72. Their difference is 48. Find the numbers.

25. Jacques has a total of $155 in $2 and $5 pizza coupons. If he has 40 coupons in all, how many of each kind does he have?

26. A rectangle with a perimeter of 180 cm is four times longer than it is wide. What are its dimensions?

27. Fraser's Plumbing charges $50 for a service call, plus $40/h for labour. Gus' Plumbing charges $30 for a service call, plus $45/h for labour.
    a) When do both companies charge the same?
    b) Which company would you hire for a repair lasting 5 h?

Answers to Units 1 & 2 Review

1. a) i) (2,3) ii) (-4,5) b) i) (11,-12) ii) (6,-4) 2. (6,-3) 3. i) and iii) 4. i) and iv)

5. i) none ii) infinite iii) one 6. Iii) 7. i) AB = 10, $m = \frac{4}{3}$ ii) $\text{MN} = \sqrt{106}$, $m = -\frac{9}{5}$

7. iii) XY = 13, $m = \frac{12}{5}$ 9. AB = 5, BC = 8, CA = 5, isosceles triangle 10. $\angle Q = 90°$ 12. Rectangle

13. i) (3,1) ii) (4.5,4) iii) (1.1,-0.7) 14. y = -2x + 5 16. y = 7x – 17 17. y = 3x – 11

18. y = -2x + 1 21. i) (0,0) ii) 10 iii) 20 iv) $x^2 + y^2 = 100$ 22. $x^2 + y^2 = 64$ 23. 14

24. 60, 12 25. 15 ($2) and 25 ($5) 26. 72 cm X 18 cm 27. a) 4 hours b) Fraser's Plumbing

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Units 3, 4 & 5 – Quadratics

1. A ball is thrown upward and the following data is collected.

Time (s)	0	1	2	3	4	5	6
Height (m)	15	39	53	57	51	35	9

i) Determine the values of the first differences and second differences.

ii) What type of relationship exists between height and time? Why?

2. Identify which of the following quadratic relations is expressed in vertex form, standard form and factored form.

i) $y = 2x^2 - 6x + 9$ ii) $y = -3(x-4)(x+6)$ iii) $y = -2(x-1)^2 + 7$

3. Given the quadratic relation $y = -\frac{1}{2}(x-5)(x+3)$, determine

i) the zeros
ii) the coordinates of the vertex
iii) the optimal value
iv) the equation of the axis of symmetry
v) direction of opening
vi) sketch the parabola

4. Determine the zeros of the following quadratic relations:

i) $y = 3(2x-1)(x+4)$ ii) $y = -4x(x+5)$ iii) $y = (5-x)(2+x)$

5. State the direction of opening, coordinates of the vertex, number of zeros, equation of the axis of symmetry and makes sketches of each quadratic relation: i) $y = 2(x-4)^2 - 3$ ii) $y = -3(x+2)^2 - 1$

6. For each quadratic relation in question 5, state the optimal value. Is it a maximum or minimum?

7. Describe in words how you would obtain the graph of $y = 3(x-4)^2 - 2$ from transformations of the graph of $y = x^2$. Make sketches of both parabolas on the same grid.

8. Review the methods of factoring: common factor, difference of squares, perfect square, trinomials.

9. Factor each of the following expressions: i) $2x^2 - 6x$ ii) $9x^2 - 64$ iii) $x^2 + 12x + 36$
iv) $x^2 - 4x - 21$ v) $6x^2 - 7x - 3$ vi) $2x^2 - 12x + 16$

10. Express the quadratic relation $y = 4(x+2)(x-3)$ in standard form.

11. Express the quadratic relation $y = x^2 + 7x - 44$ in factored form.

12. Rewrite the quadratic relations below in vertex form using the method of completing the square, and then make a sketch of each parabola. i) $y = 2x^2 - 12x + 19$ ii) $y = -3x^2 - 24x - 50$

13. Determine the zeros and vertex of the quadratic relation $y = x^2 - 6x - 7$. Make a sketch.

14. Solve each quadratic equation by factoring.

i) $x^2 - x - 30 = 0$ ii) $2x^2 = 5 - 9x$ iii) $6x^2 + 2 = 7x$

15. Solve each quadratic equation in question 14 using the quadratic formula.

16. The altitude of a triangle is 2 m longer than its base. What are the dimensions of the altitude and the base if the area of the triangle is 40 m^2?

17. The side of one square is 3 cm longer than the side of another square. If the sum of the areas of the two squares is 65 cm^2, find the lengths of the sides of each square.

18. Boris throws a ball vertically upward from the top of a cliff. The height of the ball above the base of the cliff is approximated by the model $h = 65 + 10t - 5t^2$, where *h* is the height in metres and *t* is the time in seconds.

i) How high is the cliff?
ii) How long does it take the ball to reach a height of 50 m above the base of the cliff?
iii) After how many seconds does the ball hit the ground?

19. A right triangle has a perimeter of 36 units. If the hypotenuse is 15 units, how long are the other two sides?

20. The city of Ottawa has provided 300 m of rope to enclose a rectangular swimming area along the shore of Mooney's Bay beach. What is the maximum area that can be enclosed, and the dimensions of the rectangle of maximum area? [Note: the beach is one side of the rectangle.]

Answers to Units 3, 4 & 5 Review

1. i) first differences: 24,14,4,-6,-16,-26; second differences: -10,-10,-10,-10,-10
ii) quadratic relationship since second differences are equal.
2. i) standard form ii) factored form iii) vertex form
3. i) 5, -3 ii) (1,8) iii) 8 iv) x = 1 v) downward
4. i) ½ , -4 ii) 0, -5 iii) 5, -2
5. i) opens upward, V(4,-3), two zeros, axis of symmetry x = 4 ii) opens downward, V(-2,-1), no zeros, x = -2
6. i) optimal value = -3, minimum ii) optimal value = -1, maximum
7. vertical stretch by a factor of 3, horizontal translation 4 units right, vertical translation 2 units down
9. i) 2x(x-3) ii) (3x-8)(3x+8) iii) $(x=6)^2$ iv) (x-7)(x+3) v) (3x+1)(2x-3) vi) 2(x-2)(x-4)
10. $y = 4x^2 - 4x - 24$ 11. $y = (x+11)(x-4)$ 12. i) $y = 2(x-3)^2 + 1$ ii) $y = -3(x+4)^2 - 2$
13. zeros: 7, -1; vertex (3,-16)
14. i) x = 6, x = -5 ii) x = $\frac{1}{2}$, x = -5 iii) x = $\frac{1}{2}$, x = $\frac{2}{3}$ 15. same as question 14
16. base = 8 cm, altitude = 10 cm
17. 4 cm X 4 cm and 7 cm X 7 cm
18. i) 65 m ii) 3 seconds iii) 4.74 seconds
19. 9 units, 12 units
20. maximum area = 11250 m^2, length = 150 m, width = 75 m

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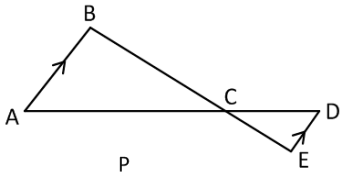
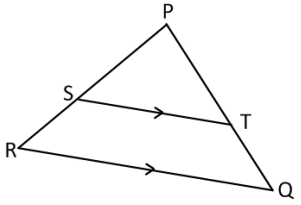
Unit 6 – Trigonometry

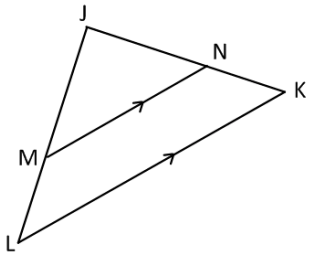


1. a) Explain why ΔABC is similar to ΔDEC.
   b) Write a proportion statement for these two triangles.



2. a) Explain why ΔPQR ~ ΔPTS.
   b) Write a proportion statement for these two triangles.

3. Solve for the lengths *x* and *y*. (diagram below)



4. Given that ΔABC ~ ΔPQR and $\frac{AB}{PQ}=\frac{BC}{QR}=\frac{CA}{RP}=\frac{3}{1}$, determine how many times bigger the area of ΔABC is than the area of ΔPQR.

5. Given that ΔXYZ ~ ΔABC and that the area of ΔXYZ is 25 times the area of ΔABC, determine the length of , determine the length of Z if the length of BC is 2 cm.

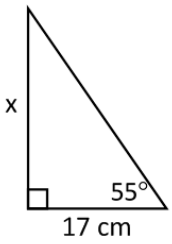
6. A line has a slope angle of $63.5°$ and passes through the point (2,3). Determine
   a) The approximate slope of the line
   b) The equation of the line

7. Find the slope angle of the line $y=\frac{1}{2}x-5$.

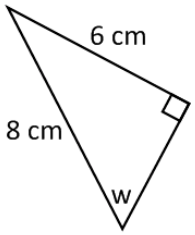
8. Review the definitions of the primary trig ratios: sine, cosine, tangent.

9. Find the length of the unknown side or angle:

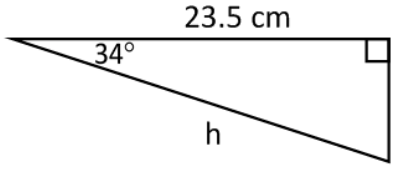
i)



ii)



iii)



10. Review the sine law and the cosine law for triangles.

11. Find $\angle C$ in ΔABC, if $\angle A=87°$, *a* = 15 cm, and *c* = 8 cm. Sketch the triangle.

12. Solve ΔPQR, if $\angle P=54°$, $\angle Q=71°$, and *r* = 47 cm. Sketch the triangle.

13. Find the measure of side *x* in ΔXYZ if *y* = 7 cm, *z* = 9 cm, and $\angle X=93°$. Sketch the triangle.

14. Solve ΔSTR if *s* = 11 cm, *t* = 9 cm and *r* = 8 cm. Sketch the triangle.

15. From the top of an 8 m house, the angle of elevation to the top of the school's flagpole across the street is 9°. The angle of depression is 42° to the bottom of the pole. How tall is the flagpole? Make a sketch.

16. Two planes leave an airport at the same time. One travels at 355 km/h and the other at 450 km/h. Two hours later they are 800 km apart. Find the angle between their courses.

17. Ship A and ship B leave a port at the same time. Ship A travels 100 km at a bearing of 37°. Ship B travels 300 km at a bearing of 125°.

a) How far apart are the two ships?
b) What bearing is ship B from ship A's position?

18. From point A, which is due west of a mountain, the angle of elevation to the top is 29°. From point B, which is due east of a mountain, the angle of elevation to the top is 35°. If points A and B are 8.2 km apart, how high is the mountain?

19. A jogger runs 3.40 km directly south, and then turns and runs 5.80 km on a bearing of 300°. What distance and in what direction should the jogger run to go back directly to the starting point? Show the steps of your solution.

Answers to Unit 6 Review

1. a) AA~ b) $\frac{AB}{DE}=\frac{BC}{EC}=\frac{CA}{CD}$ 2. a) AA~ b) $\frac{PT}{PQ}=\frac{TS}{QR}=\frac{SP}{RP}$

3. x = 18 cm, y = 5 cm
4. 9 times
5. YZ = 10 cm
6. a) m = 2 b) y = 2x – 1
7. 26.6°
9. i) x = 24.3 cm ii) w = 48.6° iii) h = 28.3 cm
11. C = 32.2°
12. R = 55°, p = 46.4 cm, q = 54.3 cm
13. x = 11.7 cm
14. S = 80.4°, T = 53.8°, R = 45.8°
15. 9.4 m
16. 58.2°
17. 313 km, bearing of 144°
18. 2.5 km
19. 5.05 km, bearing of 84°