

Final Exam – More Review

Adapted from materials originally authored by the Math Department at the Bishop Strachan School, Toronto, Ontario.

Part A: Quadratics

- Find the horizontal intercepts (a.k.a. "roots" or "zeroes") by factoring:
 - $y = x^2 - 3x - 4$
 - $y = 3x^2 - 12$
 - $y = 3x^2 - 7x - 6$
- Find the roots by using the Quadratic Formula:
 - $-5x^2 + 8x + 10 = 0$
 - $x^2 - 4x - 11 = 0$
- What are the three forms of the quadratic equation, and what does each tell you?
- What is an axis of symmetry for a quadratic relation?
- Given: (i) $y = x^2 - 12x + 27$ and (ii) $y = x^2 - 4x - 21$
 - find the zeros
 - find the vertex
 - sketch the graph
- Given: (i) $h = 25t - 5t^2$ and (ii) $h = -5t^2 - 25t + 180$ representing height h at time t
 - find the maximum height of the object
 - find the time when the object hits the ground
- A rectangle is 3 cm longer than it is wide. The length of the diagonal is 15 cm. Find the dimensions of the rectangle.
- A frame of uniform width is placed around a picture measuring 4 cm by 10 cm. If the area of the frame and picture combined is 91 cm^2 , determine the width of the frame.
- Find an equation for this quadratic relation, using an algebraic method (start with vertex or factored form). Then use a graphical method (quadratic regression using technology) to check.

x	-30	-20	-10	0	10	20	30	40
y	-7	7	17	23	25	23	17	7

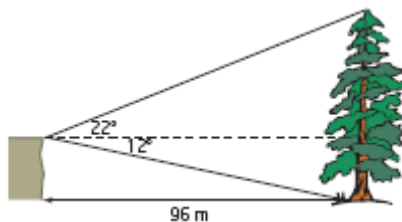
B: Linear Relations and Linear Systems

- Graph each relation using the slope and y-intercept:
 - $y = 2x + 3$
 - $2x + y = 5$
 - $x - 2y + 6 = 0$
 - $3x - 4y + 8 = 0$
- Determine the x - and y -intercept of each equation and use this information to plot the graph:
 - $x + y = 10$
 - $2x - 3y = 12$
 - $2x + 5y - 10 = 0$
 - $3x - 4y = 9$
- Determine the slope of a line that passes through each pair of points:
 - $(-2, 3)$ and $(4, -1)$
 - $(-4, -2)$ and $(-1, 6)$
- Determine the equation of the line described, and express your answer in standard form:
 - a line with slope 2 and y -intercept -3
 - a line passing through $(-3, 1)$ and with slope 3
 - a line passing through $(2, -1)$ and $(5, -7)$
- Are the pairs of lines with the following slopes parallel, perpendicular or neither?
 - $m_1 = 5, m_2 = \frac{1}{5}$
 - $m_1 = -\frac{3}{4}, m_2 = \frac{4}{3}$
- Find the equation of the line parallel to $3x + y = 6$ and passing through $(2, -4)$.
- Find the equation of a line perpendicular to $2x - 3y = 7$ and passing through $(1, 3)$.
- Solve these systems:
 - $5 - y = 2$ and $6x + 3y = 36$
 - $3x - 2y = 2$ and $-10x + 3y = 8$
- Pools R'Us charges \$50 for a service call plus \$40/h for labour. Pools Plus charges \$30 for a service call plus \$45/h for labour. For what amount of time on a service call would both companies charge the same amount?

10. Stephanie has 5 more fish in her aquarium than Brett has. The two have a total of 31 fish. How many fish do each of them have?
11. Milk and cream contain different percentages of butterfat. Some amount of 3% milk needs to be mixed with another amount of 15% cream in order to give 20 L of 6% cream? How many litres of milk and cream are needed?

Part C: Trigonometry

- Find the missing side lengths in each triangle.
 - Given $\triangle ABC$ with $\angle B = 90^\circ$ and $\angle C = 30^\circ$ and $BC = 20$ m
 - Given $\triangle ABC$ with $\angle B = 90^\circ$ and $\angle C = 40^\circ$ and $AB = 20$ m
 - Given $\triangle ABC$ with $\angle B = 90^\circ$ and $\angle C = 50^\circ$ and $AB = 20$ m
- Find the measure of $\angle C$ in each triangle.
 - Given $\triangle ABC$ with $\angle B = 90^\circ$ and $AB = 3$ m and $BC = 5$ m
 - Given $\triangle ABC$ with $\angle B = 90^\circ$ and $BC = 3$ m and $AC = 5$ m
 - Given $\triangle ABC$, $b = 15$ m, $c = 10$ m and $\angle B = 25^\circ$
- Given $\triangle PQR$, $q = 15$ m, $\angle Q = 30^\circ$ and $\angle P = 70^\circ$, find p .
- Given $\triangle ABC$, $c = 15$ m, $b = 10$ m and $\angle A = 50^\circ$, solve the triangle.
- Given $\triangle DEF$, $d = 10$ cm, $e = 15$ cm and $f = 17$ cm, solve the triangle.
- From a rock ledge, the angle of elevation to the top of a tree is 22° . The angle of depression to the base of the tree is 12° .



- Find the height of the rock ledge, to the nearest hundredth of a metre.
- Find the height of the tree, to the nearest hundredth of a metre.

Part D: Geometry

1. Which of the following points is closest to $P(-5.9, 8.3)$?
 - a. $A(-7.5, 5.8)$ or
 - b. $B(2.7, -6.1)$ or
 - c. $C(-3.5, 4.2)$?

2. Given the points $P(a, b)$ and $Q(c, d)$:
 - a. Illustrate the points on a diagram.
 - b. Give an expression for the distance between points A and B.

3. A straight path is to be built between points $A(-35, 32)$ and $B(29, -16)$, where the units represent metres. A bench is to be placed halfway along the path.
 - a. Find the distance between A and B.
 - b. Find the coordinates of the point at which the bench will be placed.

4. A sprinkler rotates in a circular path and it sprays water out to a maximum of 4 m from the sprinkler head, in all directions. Assuming the sprinkler is located at $(0,0)$ on the lawn:
 - a. Write the equation of a graph that models how far out the water lands on the surface of the lawn.
 - b. Would a flowerbed located at $(2.5, 3.5)$ receive water from the sprinkler? Justify your answer.

5. Determine the type of quadrilateral described by the vertices:
 $G(2, -2)$ $H(4, -4)$ $I(7, -1)$ $J(5, 1)$

Part A Answers:

- (a) $x = 4, x = -1$ (b) $x \pm 2$ (c) $x = 3, x = -2/3$
- (a) $x = -0.82, x = 2.43$ (b) $x = -1.87, x = 5.87$
- standard: $y = ax^2 + bx + c \rightarrow$ the vertical intercept is c
factored: $y = a(x - r)(x - s) \rightarrow$ the horizontal intercepts are r and s
vertex: $y = a(x - h)^2 + k \rightarrow$ the vertex is at (h, k)
- Vertical line through the vertex; line through middle of parabola halfway between the horizontal intercepts, $x = h$
- (i) (a) $x = 9, x = 3$ (b) $(6, -9)$ (ii) (a) $x = 7, x = -3$ (b) $(2, -25)$
- (i) (a) 31.25 m (b) 5 s (ii) (a) 211.25 m (b) 4 s
- 9 cm by 12 cm
- 1.5 cm
- $y = -0.2x^2 + 0.4x + 23$

Part B Answers:

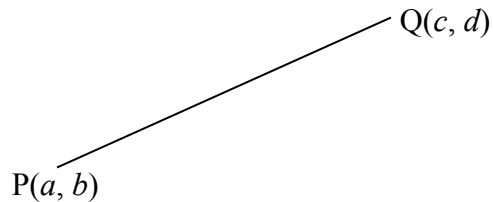
- Check using [Desmos](#).
- (a) $(10, 0)$ & $(0, 10)$
(b) $(6, 0)$ & $(0, -4)$
(c) $(5, 0)$ & $(0, 2)$
(d) $(3, 0)$ & $(0, -9/4)$
- (a) $-2/3$
(b) $8/3$
- (a) $2x - y - 3 = 0$
(b) $3x - y + 10 = 0$
(c) $2x + y - 3 = 0$
- (a) neither. (b) perpendicular
- $3x + y - 2 = 0$
- $3x + 2y - 9 = 0$
- (a) $(x, y) = (2, 8)$ (b) $(x, y) = (-2, -4)$
- 4 hours (\$210)
- Brett has 13 and Stephanie has 18
- There are 5 litres of cream and 15 litres of milk

Part C Answers:

1.
 - a. $AB = 11.5$ m, $AC = 23.1$ m
 - b. $BC = 23.8$ m, $AC = 31.1$ m
 - c. $BC = 16.8$ m, $AC = 26.1$ m
2.
 - a. $\angle C = 31^\circ$
 - b. $\angle C = 53.1^\circ$
 - c. $\angle C = 16.1^\circ$
3. $p = 28.2$ m
4. $a = 11.5$ m, $\angle B = 41.8^\circ$, $\angle C = 87.8^\circ$
5. $\angle D = 36^\circ$, $\angle E = 61^\circ$, $\angle F = 83^\circ$
6.
 - a. 20 m
 - b. 59 m

Part D Answers:

1. $AP = 2.96$, $BP = 16.77$, $CP = 4.75$, so, point A is closest.
2. (a)



- (b) $\sqrt{(a - c)^2 + (b - d)^2}$ or $\sqrt{(c - a)^2 + (d - b)^2}$
3. (-3, 8)
4. (a) $x^2 + y^2 = 16$
(b) no
5. It is a rectangle. Two opposite side lengths are $\sqrt{8}$, the other two opposite side lengths are $\sqrt{18}$, and the slopes of these pairs of sides are -1 and 1 (negative reciprocals) meaning that the sides of the figure are at right angles to each other.