

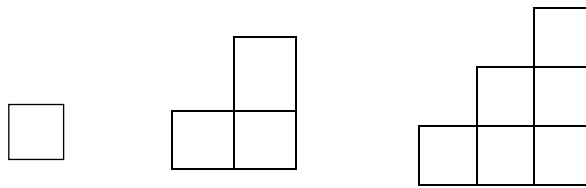
Exam Review

Algebra and Analytic Geometry

- Determine which ordered pairs are solutions to each linear system.
 - $x + y = 10$ and $2x - 5y = -1$: (6, 4), (7, 3), (12, 5), (12, -2)
 - $3x + y = -8$ and $-x + 2y = 12$: (2, -14), (6, -10), (2, 7), (-4, 4)
- Determine the number of solutions to each linear system.
 - $y = 3x - 5$
 $y = 4x + 6$
 - $y = 4x - 3$
 $y = 4x - 7$
 - $3x + 4y = 8$
 $4.5x + 6y = -12$
 - $2x + 3y = 10$
 $10x + 15y = 50$
- Solve each system of equations. Use substitution or elimination as appropriate.
 - $2x + y = 3$
 $3x + 2y = 5$
 - $3a = 2b - 10$
 $b + 15 = 3a$
 - $m - 3n = 11$
 $2m = -10n + 6$
 - $6x = 12 - 3y$
 $y - 2x = -16$
 - $2a - 3b = 13$
 $5a - b = 13$
 - $3x + 21 = 5y$
 $4y + 6 = -9x$
 - $8x - 3y = 22$
 $6x + 12y = -12$
 - $7 + y = 4x$
 $3x + 2y = -3$
- Solve the system: $\frac{x}{2} + \frac{y}{8} = 4$ and $\frac{x}{3} - \frac{y}{2} = -2$
- As the owner of a banquet hall, you are in charge of catering a reception. There are two dinners: a chicken that costs \$16 and a beef dish that costs \$18. The 300 wedding guests have ordered their meals in advance, and the total cost to prepare the dinner is \$ 5256. How many of each type of dinner are you preparing?
- Movies to Go rents videos for \$5 and has no membership fee. Videorenters rents videos for \$4.50 and has a \$10 membership fee. What advice would you give someone deciding which store to use?
- Jeff is a cashier at the grocery store. He has a total of \$550 in bills. He has 76 bills, consisting of \$5 bills and \$10 bills. How many of each type does he have?
- Milk and cream contain different percents of butterfat. How much 3% milk needs to be mixed with how much 15% cream to give 20 L of 6% cream?
- The sum of two numbers is 78. Their difference is 6. Find the numbers by solving a linear system.
- Ms. Costigan set up a Math Scholarship for the Parent Council. They collected \$10 000 and invested some in a term deposit that pays 4%, and the remainder in bonds that pay 5%. Each year, they want to award the interest to a student. If they earned \$440 in interest, how much did they invest at each rate?
- An air traffic controller is tracking two planes whose paths are modelled by the equations $y = 2x + 1$ and $4x - 2y = 5$. Do either of the planes need to change course? Explain.

Quadratic Relations

1. a) The three diagrams in a pattern are made up of squares of side length 1 unit. Complete the following chart for the pattern shown above.



| Base Length, b | Area, A |
|----------------|---------|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |

- b) Is the relation between the base length (b) and the area (A) linear or quadratic or neither? Why or why not? Show your work that leads you to this conclusion.

2. Expand and simplify.

a) $(2x - 5)(3x + 1)$

b) $(4x - 3)^2$

c) $2(x + 3)(4x + 5) - x^2$

3. Factor the following expressions completely.

a) $x^2 + 3x - 18$

b) $5x^2 + 25x + 30$

c) $9a^2 - 16b^2$

d) $2x^2 + 5x - 12$

e) $4x^2 - 12x + 9$

f) $3x^3 - 18x^2 - 2x + 12$

4. Simplify, using positive exponents.

a) $x^0 + y^0$

b) $\left(\frac{3}{4}\right)^{-5}$

c) $(4m^{-1}n^3)^{-3}$

5. The zeros of a quadratic relation are -3 and 9. The second differences are positive.

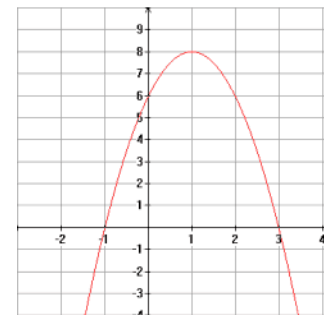
a) Explain whether the optimal value will be a maximum or a minimum.

b) What value of the independent variable will produce the optimal value?

c) Explain whether the optimal value is a negative or positive value.

6. Write an equation of a quadratic with x-intercepts at -6 and 2 that passes through the point (-4, 3).

7. Find the equation of the parabola in the diagram in **standard form**.



8. A ball is thrown upward from the roof of a building. The ball reaches a maximum height of 45m above the ground after 2 seconds, and hits the ground 5 seconds after being thrown.

a) Draw a sketch of the relation.

b) What are the zeros of the relation?

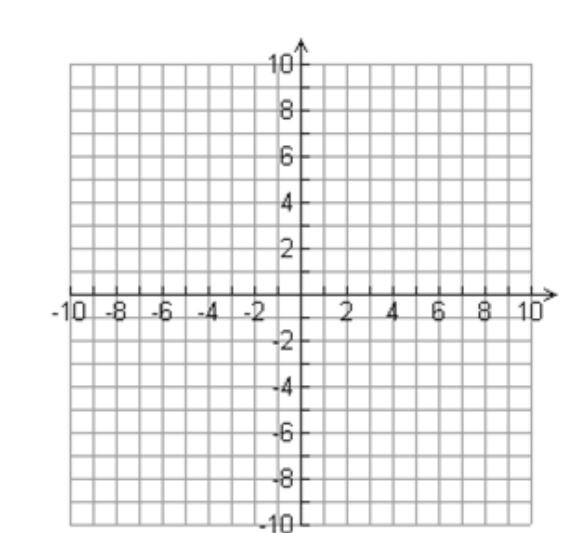
c) Determine an algebraic expression, in factored form, that models this situation.

d) How tall is the building?

9. A city has budgeted for 40 m of fencing to create a rectangular play area at the community park. The play area will be fenced on all four sides. What is the maximum area that can be fenced off?
10. A senior's dance club has a \$5 cover charge and averages 300 customers on a Friday night. Over the past several months, the club has changed the cover price several times to see how it affects the number of customers. They discovered that for every increase of \$0.25 in the cover charge, the number of customers decreases by 30.
- What cover charge maximizes the revenue?
 - What is the maximum revenue?
11. What transformations must you apply to $y = x^2$ to create the new graph? List the transformations in the order that you would apply them.
- $y = -x^2 + 9$
 - $y = 5(x + 2)^2$
 - $y = -\frac{1}{2}(x - 4)^2 - 7$
12. For the quadratic relation $y = \frac{1}{2}(x + 7)^2 - 4$ state:
- The coordinates of the vertex.
 - The equation of the axis of symmetry.
 - The direction of the opening.
13. Express $y = 2(x + 3)^2 - 8$ in standard form and factored form.

14. Graph the following quadratic relations.

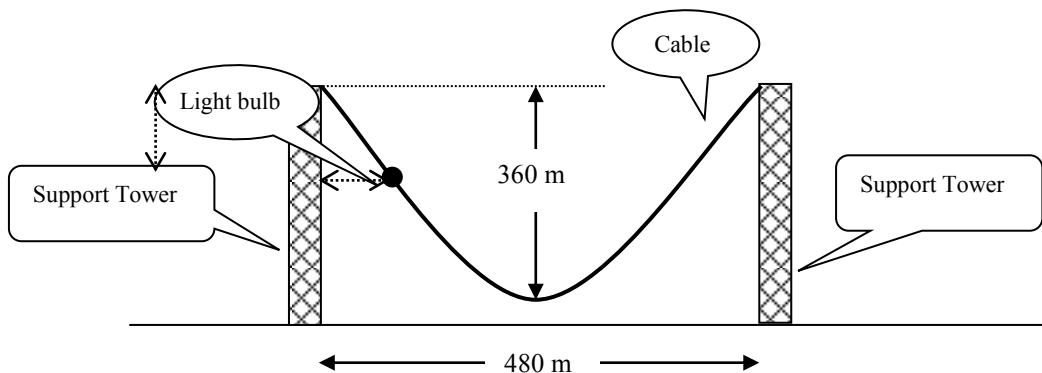
- $y = -2(x - 1)^2 + 5$
- $y = 3(x + 4)^2 - 8$



15. Find an equation in vertex form for the quadratic with vertex at $(-2, 6)$ that passes through the point $(-1, 3)$.

16. The diagram shows a suspension bridge with a cable suspended between two support towers that are 480 m apart. The cable is opening up in the shape of a parabola. The vertical distance from the top level of the towers to the lowest point of the cable is 360 m.

a) Find a quadratic equation, in vertex form, that models the shape of the cable.



b) Suppose a light bulb has been installed at a horizontal distance of 120 m from the nearest tower. Find the vertical distance that the light bulb is below the top level of the towers.

17. Express the equation in vertex form by completing the square.

a) $y = 3x^2 - 9x$

b) $y = x^2 + 16x + 9$

c) $y = -4x^2 + 8x + 9$

d) $y = -3x^2 + 6x - 7$

e) $y = 0.2x^2 + 2x + 9$

f) $y = 6x^2 + 12x + 7$

18. Find the roots of the following using the most appropriate method.

a) $x^2 - 4x + 3 = 0$

b) $-3x^2 - 2x = -10$

c) $(x + 1)^2 - 9 = 0$

d) $x^2 + 4x - 21 = 0$

e) $-3(x - 5)^2 + 27 = 0$

f) $6x^2 = 5 - 13x$

g) $6x^2 - x - 15 = 0$

h) $x^2 - 11 = 0$

i) $12x^2 - 40 = 17x$

19. Determine the number of real roots in each equation.

a) $3(x + 5)^2 - 5 = 0$

b) $x^2 + 9 = 0$

c) $-2(x - 4)^2 = 0$

d) $x^2 + 5x - 8 = 0$

e) $9x^2 + 12x + 4 = 0$

20. An object is thrown upward from the top of a building. The height of the object above the ground, h metres, t seconds after being thrown, is modelled by the equation $h = -4.9t^2 + 19.6t + 104$.

a) What is the height of the tower?

b) At what time will the object reach its maximum height?

c) What would be the maximum height of the object above the ground.

d) What is the height of the object after 2.5 s? Is it on the way up or down?

e) From the time it is thrown, how long would it take the object reach the ground?

21. Suppose that the population of a town is described by $P = 0.36t^2 - 7.2t + 100$, where P is the population in thousands and t is the time in years, with $t=0$ representing the year 2000.

a) What was the population in 1995?

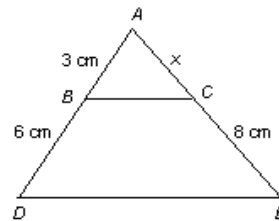
b) When will the population reach 70,000?

c) According to the model, will the population ever reach 50,000? Explain.

22. The TTC bus company has 3000 passengers using the #129 route daily, each paying a fare of \$2. A survey shows that for every \$0.2 increase in fare, the route will lose 50 passengers. If the company need to take in \$10 000 per day to keep the bus service, what is the minimum fare that should be charged?
23. The size of a television screen or a computer monitor is usually stated as the length of the diagonal. A screen has a 38 cm diagonal. The width of the screen is 6 cm more than the height. Find the dimensions of the screen, to the nearest tenth of a centimetre.
24. An area rug has a central 5 m by 3 m rectangle in a mosaic pattern, with a plain border of uniform width around it. The total area of the rug is 24 m^2 . Find the width of the border.

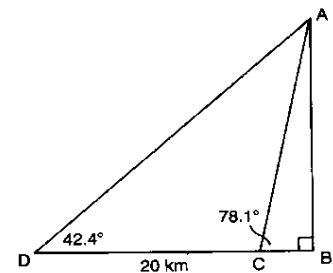
Trigonometry

1. In this diagram, BC is parallel to DE .
 - a) Prove the triangles are similar.
 - b) Find the length of x .



2. A telephone pole is broken by the wind. The top of the pole touches the ground 13 m from the base and makes an angle of 30° with the ground. Find the original height of the pole.
3. A helicopter is involved in an air rescue mission. The pilot determines that the angle of depression from the helicopter to the disabled aircraft carrier is 15° . The helicopter is flying at an altitude of 800 m. What is the horizontal distance from the helicopter to the carrier?
4. The posts of a hockey goal are 2 m apart. A player attempts to score by shooting the puck along the ice from a point 7 m from one post and 6 m from the other. Within what angle must the shot be made?
5. A plot of land is the shape of a triangle. Two of the angles measure 48° and 74° . The length of the side between them is 90 m.
 - a) Calculate the perimeter of the plot to the nearest metre.
 - b) Calculate the area of the plot to the nearest metre.

6. Two tracking stations 20 km apart measure the angles of elevation of a rocket to be 42.4° and 78.1° . Find the height of the rocket.



Answers to Exam Review

Algebra and Analytic Geometry

1. a) (7, 3) b) (-4, 4) 2. a) one (different slopes) b) none (same slope, different y-intercept)
 c) none (common ratio 1.5 for A and B) d) infinite (common ratio 5 for all) 3. a) (1, 1) b) $\left(\frac{40}{3}, 25\right)$
 c) (-1, 8) d) (5, -6) e) (2, -3) f) (-2, 3) g) (2, -2) h) (1, -3) 4. (6, 8)
 5. 72 chickens and 228 beef dinners 6. Movies to Go for less than 20 movies and Videorenters for more than 20 movies
 7. 42 \$5 bills and 34 \$10 bills 8. 15 L of milk and 5 L of cream 9. 42 and 36 10. \$6000 in term deposits and \$4000 in bonds
 11. No, there is a common ratio of 2 for A and B therefore the planes are parallel.
 12. a) (6, -4) b) 7.07 units 13. Plane A 14. $x^2 + y^2 = 81$ 15. a) $x^2 + y^2 = 73$
 b) $x^2 + y^2 = 97$ 16. a) centre: (0, 0), radius: 3, x-intercept: (3, 0) and (-3, 0), y-intercept: (0, 3) and (0, -3)
 b) centre: (0, 0), radius: 1/2, x-intercept: (1/2, 0) and (-1/2, 0), y-intercept: (0, 1/2) and (0, -1/2) 17. 37.27 s
 18. right scalene triangle 19. Square 20. a) (7, -1) b) $d_{QS} = 7.1$ units, $d_{PR} = 7.1$ units c) midpoint
 21. It does not 22. (3, 0) 23. (5/3, 1) 24. 3.79 units

Quadratic Relations

1. b) Quadratic, constant second differences 2. a) $6x^2 - 13x - 5$ b) $16x^2 - 24x + 9$ c) $7x^2 + 34x + 30$
 3. a) $(x + 6)(x - 3)$ b) $5(x + 3)(x + 2)$ c) $(3a - 4b)(3a + 4b)$ d) $(2x - 3)(x + 4)$ e) $(2x - 3)^2$
 f) $(x - 6)(3x^2 - 2)$ 4. a) 2 b) $\frac{1024}{243}$ c) $\frac{m^3}{64n^9}$ 5. a) minimum b) $x = 3$
 c) negative 6. $y = -1/4(x + 6)(x - 2)$ 7. $y = -2x^2 + 4x + 6$ 8. b) (5, 0) and (-1, 0)
 c) $y = -5(x + 1)(x - 5)$ c) 25 m 9. 100 m² 10. a) \$3.75 b) \$1687.50 11. a) Reflect across the x-axis, vertical shift 9 spaces up b) Vertical stretch by factor of 5, horizontal shift 2 spaces left
 c) Vertical compression by factor of 1/2, horizontal shift 4 spaces right and vertical shift 7 spaces down
 12. a) (-7, -4) b) $x = -7$ c) up 13. $y = 2x^2 + 12x + 10$, $y = 2(x + 5)(x + 1)$
 15. $y = -3(x + 2)^2 + 6$ 16. a) $y = 0.00625(x - 240)^2 - 360$ b) 270 m below the top of the tower
 17. a) $y = 3(x - 1.5)^2 - 6.75$ b) $y = (x + 8)^2 - 55$ c) $y = -4(x - 1)^2 + 13$ d) $y = -3(x - 1)^2 - 4$
 e) $y = 0.2(x + 5)^2 + 4$ f) $y = 6(x + 1)^2 + 1$ 18. a) $x = 1$, $x = 3$ b) $x = 1.52$, $x = 3$ c) $x = 2$, $x = -4$
 d) $x = -7$, $x = 3$ e) $x = 2$, $x = 8$ f) $x = 1/3$, $x = -5$ g) $x = 5/3$, $x = -3/2$
 h) $x = 3.32$, $x = -3.32$ i) $x = -5/4$, $x = 8/3$ 19. a) 2 roots b) 0 roots c) 1 root
 d) 2 roots e) 1 root 20. a) 104 m b) /c) 123.6 m at 2 s d) 122.375 m
 e) 7.02 s 21. a) 145 000 b) 2006 and 2014 c) No 22. \$3.40
 23. 25.9 cm x 27.9 cm 24. 0.5 m

Trigonometry

1. b) 4 cm 2. $x = 7.5$ m, $y = 15.2$ m, total length is 22.5 m 3. 2985.6 m 4. 15°
 5. a) 279.3 m b) 3411 m² 6. 15.3 km