polynomial

term

monomial, binomial, trinomial

simplify

distributive property

factoring

common factoring

factoring by grouping

difference of squares factoring

simple trinomial factoring

tricky trinomial factoring

relation

function

function notation

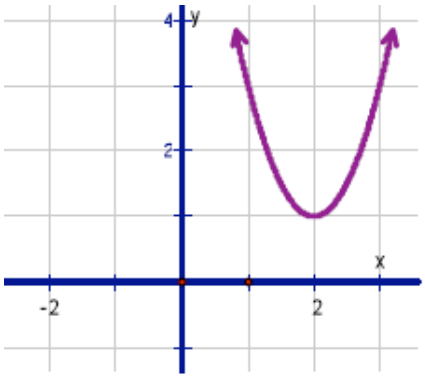
domain & range

Answers:

1. a) f(3) = 3 b) f(2) = 1 c) {x|x∈R} d) {y|y∈R, y ≥ 1}
2. f(-2) = – 17 3. f(3) = 4 4. a) D = {x|x∈R, x ≥ -2, x ≤ 4}, R = {y|y∈R, y ≥ 1, y ≤ 4}
b) D = {x|x∈R, x ≥ -1, x ≤ 4}, R = {y|y∈R, y ≥ 0, y ≤ 4} c) D = {x|x∈R, x ≥ -2, x ≤ 2}, R = {y|y∈R, y ≥ -5, y ≤ 5}
5. $12x^2 – 20x – 8$ 6. a) $3xyz^3(x + 5y^3z^2 – 6x^3yz)$ b) (x + 5)(7x – 2)
c) (x – 5)(x + 5) d) $(t – 3)^2$ e) (n + 3)(n + 2) f) 4x(x – 4)(x + 4)
g) 2(3y + 1)(y – 1) h) (2x + 1)(x + 4) 7. a) $m = \sqrt{p^2 - n^2}$ b) $m = \frac{y-b}{x}$
c) 15qn – r d) $m = \sqrt[3]{\frac{h+2g}{d}}$

Unit 0/1: Algebraic Skills/Functions: Exam Review Questions

1. For the relation *f(x)* shown to the right,



   a) *f(3)* = _____

   b) *f(_____)* = 1

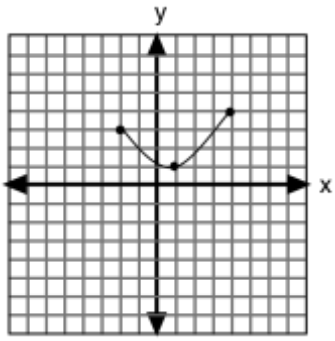
   c) The domain is _____

   d) The range is _____

2. If $f(x) = 3x - 11$, then *f(-2)* = _____

3. Find *f(3)* if *f(x)* = $x^2 - 2x + 1$

4. State the **domain** and **range** of the following relations. For each relation state whether it is a **function or not** and <u>why</u>.

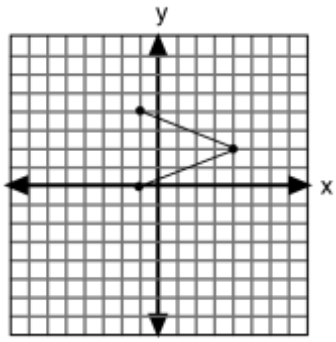


D = _____

R = _____

Function? _____

WHY?

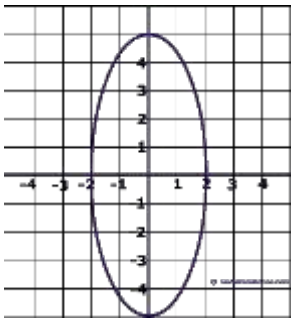


D = _____

R = _____

Function? _____

WHY?



D = _____

R = _____

Function? _____

WHY?

5. Expand and simplify: $(6x + 2)(2x - 4)$ _____

6. Fully factor each expression.

a) $3x^2yz^3 + 15xy^4z^5 - 18x^4y^2z^4$

b) $7x(x + 5) - 2(x + 5)$

c) $x^2 - 25$

d) $t^2 - 6t + 9$

e) $n^2 + 5n + 6$

f) $4x^3 - 64x$

g) $6y^2 - 4y - 2$

h) $2x^2 + 9x + 4$

7. Solve the following word problems for the variable ***m***:

a) $p^2 = m^2 + n^2$

b) $y = mx + b$

c) $5n = \frac{m+r}{3q}$

d) $dm^3 - g = (h + g)$

linear and *quadratic* relation

first & second differences

direction of opening

vertex

maximum & minimum

axis of symmetry

vertex form – roles of ***a***, ***h***, and ***k*** in $y = a(x - h)^2 + k$

transformation

vertical expansion & compression

reflection across the x-axis

vertical and horizontal translation

factored form*

vertex form*

standard form*

**be able to <u>convert</u> between all three forms*

**be able to <u>graph</u> all three forms*

**know the <u>features</u> of all three forms*

Answers:	1. a) $y = (x - 4)^2 - 19$	b) $y = 3(x - 1)^2 - 1$		2. i) (– 3, 0), (5, 0)	ii) x = 1
	iii) (1, 32)	iv) $y = -2(x - 1)^2 + 32$		v) $y = -2(x - 5)(x + 3)$	vi) (0, 30)
	3. a) V(– 1, – 2)	b) V(– 4, – 8)		4. a) 115 m	b) 4 s
	c) 67 m	5. a) 4.6 m	b) 3 m	c) 1 m	d) 1 m

Unit 2: Forms and Transformations of Quadratic Functions – Exam Review Questions

1. Complete the square on the following quadratics:

a) $y = x^2 - 8x - 3$

b) $y = 3x^2 - 6x + 5$

2. Given the factored form of the quadratic function $y = -2x^2 + 4x + 30$, determine:

i) the coordinates of the zeros/x-intercepts _____

ii) the equation of the axis of symmetry _____

iii) the coordinates of the vertex _____

iv) the vertex form of the function _____

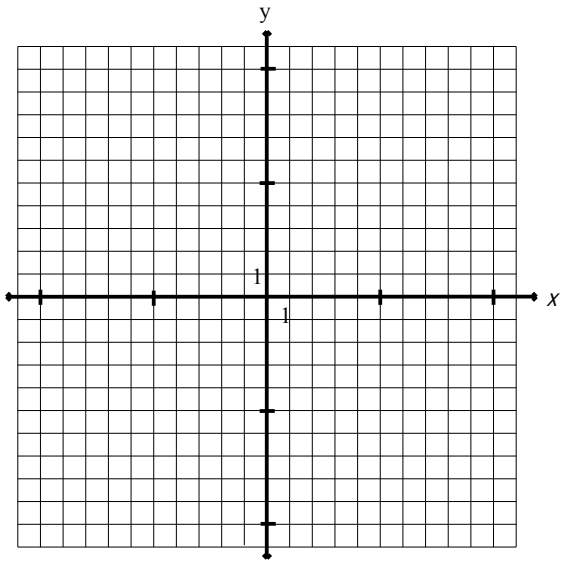
v) the factored form of the function _____

vi) the coordinates of the y-intercept _____

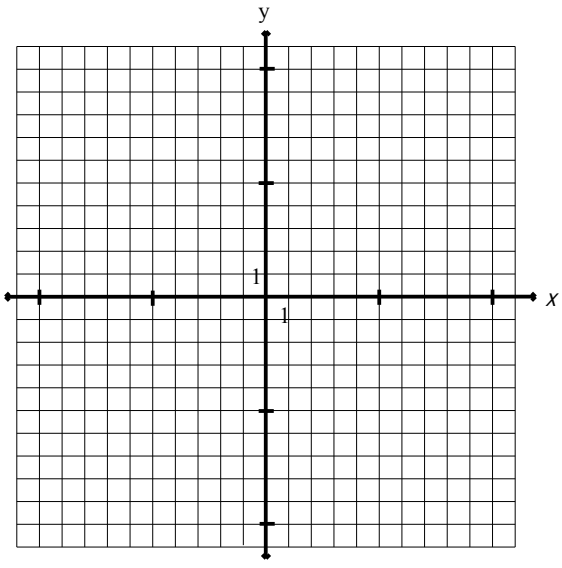
(Use the space below to organize your work for part marks.)

3. Graph the following two quadratics like a champion!

a) $f(x) = 3x^2 + 6x + 1$



b) $f(x) = \frac{1}{2}x\,(x + 8)$



4. The flight path of a firework is modelled by the function $h(t) = -3(t-4)^2 + 115$, where *h* is the height, in metres, *t* seconds after being fired.

a) What is the maximum height reached by the firework? _____

b) When did the firework reach its maximum height? _____

c) What height above ground was the firework fired from? _____

(Use the space below to organize your work for part marks.)

5. A football is passed from one teammate to another during a game. The football follows the path defined by the equation $h = -0.4d^2 + 2.4d + 1$, where *h* is the height, in metres, above ground and *d* is the horizontal distance, in metres, from the thrower.

a) Determine the maximum height of the football. _____

b) What is the horizontal distance from the thrower, when the football is at maximum height?_____

c) If the football is intercepted by a player 6 m down the field, how high will it be at the moment it is intercepted? _____

d) Determine the height of the football when it was thrown. _____

(Use the space below to organize your work for part marks.)

How to Graph a Quadratic Function (Given *Any* Form)!

	Characteristics	What To Do . . .
Vertex Form	$f(x) = a(x - h)^2 + k$ **or** $y = a(x - h)^2 + k$ • In this form, the only <u>point</u> evident is the <u>vertex</u>, (*h, k*)	• Plot and label the vertex, (*h, k*) • From the vertex, move horizontally (⇔) 1 unit, and vertically (⇳) $1^2(a)$ units (on either side); then, move horizontally 2 units, and vertically $2^2(a)$ units; [repeat with 3 units and $3^2(a)$ units, if necessary, to get accurate end behaviour] • Sketch and label the axis of symmetry, $x = h$
Factored Form	$f(x) = a(x - r)(x - s)$ **or** $y = a(x - r)(x - s)$ • In this form, the only <u>points</u> evident are the <u>x-intercepts</u>, (*r,* 0) and (*s,* 0) • the x-value of the vertex ("*h*") can be calculated by finding the value of $\frac{r+s}{2}$ • the y-value of the vertex ("*k*") can be calculated by finding the value of *f(h)*	• Plot and label the x-intercepts, (*r,* 0) and (*s,* 0) • Find and plot the vertex, (*h, k*), using: ○ $h = \frac{r+s}{2}$ ○ $k = f(h)$ • From the vertex, move horizontally (⇔) 1 unit, and vertically (⇳) $1^2(a)$ units (on either side); then, move horizontally 2 units, and vertically $2^2(a)$ units; [repeat with 3 units and $3^2(a)$ units, if necessary, to get accurate end behaviour] • Sketch and label the axis of symmetry, $x = h$
Standard Form	$f(x) = ax^2 + bx + c$ **or** $y = ax^2 + bx + c$ • In this form, the only <u>point</u> evident is the <u>y-intercept</u>, (0, *c*) • the x-value of the vertex ("*h*") can be calculated by finding the value of $\frac{-b}{2a}$ • the y-value of the vertex ("*k*") can be calculated by finding the value of *f(h)*	• Plot and label the y-intercept, (0, *c*) • Find, plot, and label the vertex, (*h, k*), using: ○ $h = \frac{-b}{2a}$ ○ $k = f(h)$ • From the vertex, move horizontally (⇔) 1 unit, and vertically (⇳) $1^2(a)$ units (on either side); then, move horizontally 2 units, and vertically $2^2(a)$ units; [repeat with 3 units and $3^2(a)$ units, if necessary, to get accurate end behaviour] • Sketch and label the axis of symmetry, $x = h$
***Any* Form**	• any function can be graphed using a table of values • any uncertain points on a graph can be checked using a table of values • WARNING! Tables of values can be very time consuming, and should be used as a last resort.	

quadratic equation

quadratic function

roots/solutions

x-intercepts/zeros

quadratic formula

solve a quadratic equation 4 ways:

algebraically (by taking square roots)

factoring

graphing

quadratic formula

nature of roots/zeros/solutions (0, 1, or 2 real solutions)

discriminant

area problems

Answers: 1. a) $x = -1, 7$ b) $x = \pm 9$ 2. a) $x = 2, 12$ b) $x = 1, -9/2$ 3. a) $x = 0.86$ b) $x = -0.19$
4. a) $D = 0$, 1 real root b) $D = -303$, no real roots 5. a) 2 real roots b) 1 real roots
c) no real roots 6. 2.5 m 7. b) V (1, 9), $x = 1$ c) $D = \{x | x \in R\}$ $R = \{y | y \in R, y \leq 9\}$

Unit 3: Solving Quadratic Equations – Exam Review Questions

1. Solve the following equations <u>algebraically</u> by taking square roots.

   a) $2(x-3)^2 - 32 = 0$ **b)** $4x^2 + 3 = 327$

2. Solve the following equations <u>by factoring</u>.

   a) $x^2 - 14x + 24 = 0$ **b)** $2x^2 + 7x - 9 = 0$

3. Solve the following equation by using the <u>quadratic formula</u>. Round decimal answers to the nearest hundredth: $6x^2 - 4x - 1 = 0$

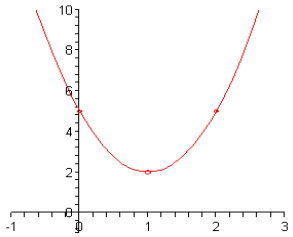
4. Use the <u>discriminant</u> to determine the **nature of the roots** (the number of real solutions) for each equation.

   a) $2x^2 - 4x + 2 = 0$ **b)** $-3x^2 = -9x + 32$

5. **Without solving**, determine the nature of the roots/zeros of the quadratic equations/functions, given the following information:

a) the discriminant is 2 _____

b) $x^2 - 6x + 9 = 0$ _____

c) 

_____

6. A rectangular swimming pool measuring 10 m by 4 m is to be surrounded by a deck of uniform width. The combined area of the deck and pool should be 135 m^2. What is the width of the deck?

7. A parabola is modelled by the function $f(x) = -(x + 2)(x - 4)$

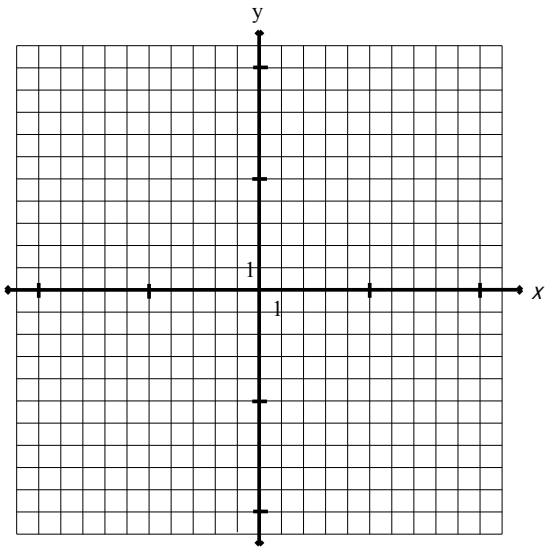
a) Sketch the parabola and **label** it with its equation.

b) Label the vertex, axis of symmetry, and any other key points.

c) Write the **domain** and **range** of the function.

D = _____

R = _____



opposite, adjacent, & hypotenuse

Sine, Cosine, & Tangent

primary trigonometric ratios **(SOH CAH TOA)**

angle of *elevation*

angle of *depression*

Sine Law

Cosine Law

Answers: 1. y = 8.4 cm 2. ∠D = 78°, ∠A = 42°, g = 8.4 cm 3. ∠θ = 5° 4. AB = 4.67 m
5. a) 0.58 m b) 4.21 m c) 139°

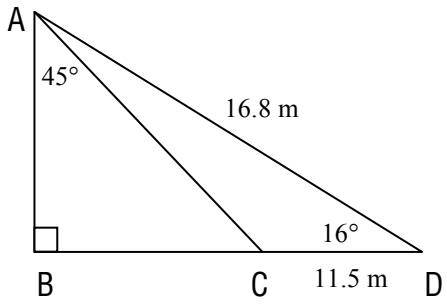
Unit 4: Trigonometry – Exam Review Questions

1. Given ΔXYZ, with $\angle Y = 90^{o}$, $\angle X = 57^{o}$ and $z = 4.6\ cm$ determine the measure of y, to one decimal place. Include a diagram with your solution.

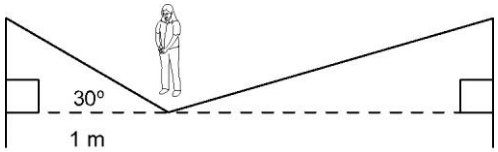
2. Solve ΔDAG, given $d = 9.5$ cm, $a = 6.3$ cm and $\angle G = 60^{o}$. Round side lengths to one decimal place and angles to the nearest degree. Include a diagram.

3. The pendulum of a clock is 90.0 cm long. The total horizontal distance travelled in one swing is 7.9 cm. Determine the angle through which the pendulum swings. Round your answer to the nearest degree. Include a diagram with your answer.

4. Determine the length of AB to the nearest tenth of a metre.



5. Monika is bouncing on a trampoline. At a point when the trampoline is fully stretched, she is 1 m from the left edge and the angle of elevation from her feet to the top left edge is 30°.



a) How far has Monika sunk into the trampoline, rounded to two decimal places?

b) The width of the trampoline is 4 m. What is the length of the stretched surface, rounded to two decimal places?

c) What is the angle between the two slanted surfaces of the trampoline, to the nearest degree?

angles in standard position

coterminal angles

positive/negative angles

quadrants

Sine functions: $y = a \sin (x - d) + c$

5 key points

amplitude

period

phase shift

vertical translation

equilibrium axis: $y = c$

Answers:

1. -220°, - 580°, 500°, 860°
2. Q IV
3. a) $y = -7$ b) A = 4 c) VT = 7 units down
d) min = – 11 e) max = – 3 f) {y|y∈R, y ≥ – 11, y ≤ – 3 4. a) x-axis reflection
b) vertical stretch factor of 2 c) P. S. Of 60° right d) V. T. of 13 units up
5. a) y = 6sinx + 2 b) y = – 7sin(x + 100°) c) y = 3sin(x – 65°) + 15
d) y = – 5sin (x + 20°) – 4 6. R = {y|y∈R, y ≥ – 1, y ≤ 3} 7. R = {y|y∈R, y ≥ – 6, y ≤ 0}
8. R = {y|y∈R, y ≥ – 2.5, y ≤ – 1.5}

Unit 5: Sine Functions – Exam Review Questions

1. Sketch two angles that are co-terminal to 140°.

2. Sketch an angle of 290° in standard position and label its quadrant.

3. Given the function $y = 4\sin x - 7$;

a) the equilibrium axis is _____

b) the amplitude is _____

c) the vertical translation is _____

d) the minimum value is _____

e) the maximum value is _____

f) the range is _____

4. Given the function $y = -2\sin(x - 60°) + 13$, list the transformations to the mother function ***y = sin x***:

a) _____

b) _____

c) _____

d) _____

5. Write an equation for each sine function.

a) *amplitude is 6, vertically translated 2 units up*

***y* = _____**

b) *reflection across the x-axis, amplitude is 7, phase shifted 100° to the left*

***y* = _____**

c) *amplitude is 3, phase shifted 65° to the right, vertically translated 15 units up*

***y* = _____**

d) *reflection across the x-axis, amplitude is 5, phase shifted 20° to the left, vertically translated 4 units down*

***y* = _____**

6. $y = -2\sin x + 1$ *(Graph one cycle)* **Range =** _____

7. $y = 3\sin\left(x - 50^{o}\right) - 3$ *(Graph one cycle)* **Range =** _____

8. $y = 0.5\sin\left(x + 90^{o}\right) - 2$ *(Graph one cycle)* **Range =** _____

Exponent laws

multiplying/dividing bases with the same exponents

powers of powers

zero exponents

negative exponents

fractional exponents (i.e. rational exponents)

roots

Exponential functions: $y = a(b)^x$

growth ($b > 1$)

decay ($0 < b < 1$)

half-life ($b = ½$)

Recognize linear vs. quadratic vs. exponential functions

graphically

equations

table of values (1^{st} and 2^{nd} differences; ratios of y-values)

Answers:

1. a) z^{12} b) $(mn^4)/3$ c) b^0 d) $9x^{10}$ e) m^7 f) $y^{(2/7)}$
2. a) 1/32 b) 16 c) – 2 d) (– 81)/10 000 e) – 4 f) – 2/5
3. a) 14.14 g b) 10 g c) 2.5 g
4. Increasing
5. i) {x|x∈R, x ≥0}
   ii) {y|y∈R, y≤800, y >0} iii) y = 0
6. Quadratic has constant 2^{nd} differences
7. Exponential has a variable exponent
8. Linear has a straight line for constant slope
9. a) $P(n) = 749(1 – 0.12)^n$ b) $347.84
10. a) greater than predicted b) 4448 people

Units 6/7: Exponent Laws/Exponential Functions: Exam Review Questions

1. Simplify.

a) $(z^3)^4$ = _____

b) $\frac{6m^2n^7}{18mn^3}$ = _____

c) $(b^3)(b^{-3})$ = _____

d) $(3x^5)^2$ = _____

e) $\frac{m^2}{m^{-5}}$ = _____

f) $\left(y^{\frac{3}{7}}\right)\left(y^{-\frac{1}{7}}\right)$ = _____

2. Evaluate. No decimal answers.

a) $8^{-\frac{5}{3}}$ = _____

b) $\left(-\frac{1}{2}\right)^{-4}$ = _____

c) $\sqrt[5]{-32}$ = _____

d) $\left(-\frac{1000}{27}\right)^{-\frac{4}{3}}$ = _____

e) $(-64)^{\frac{1}{3}}$ = _____

f) $\sqrt[3]{-\frac{8}{125}}$ = _____

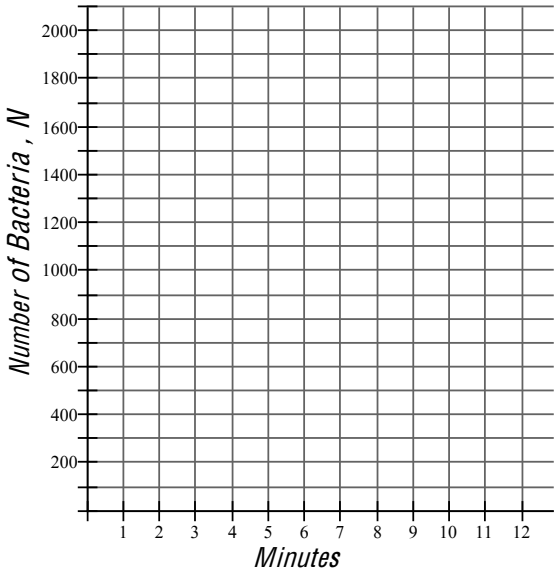
3. The biological half-life of Tritium in the human body is 10 days. If a person ingested 20 g of Tritium, how much would be left after: 5 days? _____ 10 days? _____ 30 days? _____

(Use the space below to show your work, and place your final answers on the lines.)

4. Is the function $y = 1500(3.75)^x$ increasing or decreasing over its domain? _____

5. Graph the function $N(m) = 800\left(\frac{1}{2}\right)^{\frac{m}{4}}$

over 12 minutes, where *N* is the number of bacteria remaining after *m* minutes exposure to an antibiotic.



For this function, state the following:

i) domain: _____

ii) range: _____

iii) equation of the asymptote: _____

6. Explain how you would determine a function is quadratic by examining its table of values.

7. Explain how you would determine a function is exponential by examining its equation.

8. Explain how you would determine a function is linear by examining its graph.

9. An iPad was purchased this year for $749. In general, electronic devices depreciate by 12% each year.

a) Write an exponential equation describing this situation: _____

b) What will the iPad be worth in 6 years? _____

10. The population of Elora, Ontario, was 4546 in 2001, when the last census was taken. Average township growth in that region is 1.1%. When the census was taken in 2011, Elora's population was 5200 people.

a) Is the growth of Elora greater than, less than, or as predicted using the average township growth rate? Use an equation and calculation to support your response.

b) Using the same formula, estimate the population of Elora in 1999, when it officially become a town.

interest rate

principal

term

simple interest

compounding period

compound interest – future value

compound interest – present value

ordinary annuities – future value

ordinary annuities – present value

ordinary annuities – payments

appreciation/depreciation

Answers:

1. 21 months 2. 9.375% 3. a) 2998.58 b) 1800 c) 6% d) 8 years
4. a) $8884.33 b) $3884.33 5. $9139.64 6. $252.86 7. a) $18 500.11 b) $23 948.40
8. Scenario 1 with $71 562.93 (including the highest interest at $29 562.93)

Unit 8: Financial Applications – Exam Review Questions

1. Mr. Red lent Mr. Green $800 at a simple interest rate of 10% annually. Mr. Green ended up repaying $940 to Mr. Red. For how many months did Mr. Green owe Mr. Red the money?

2. Mr. Yellow invested $3200 for 3 years and earned $900 simple interest. What was the annual interest rate on his investment?

3. If the compounding period is **quarterly**, and given the formula $2998.58 = 1800(1 + 0.015)^{32}$;

a) the future value is _____

b) the present value is _____

c) the interest rate is _____

d) the investment length is _____

4. Mrs. Purple invests $5000 for 12 years, into an account with 4.8% annual interest, compounded monthly.

a) How much money does she have in her account in 12 years?

b) How much interest did Mrs. Purple earn during those 12 years?

5. In order to have $45 000 for their grandson's post-secondary education, Mr. and Mrs. Brown start an investment on their grandson's first birthday. Assuming their grandson attends post-secondary education when he turns 18, how much must Mr. and Mrs. Brown invest today at 9.6% interest, compounded semi-annually, to make this happen?

6. Mr. Black has a bank account with $15 000. The account earns interest at 6.6%, compounded monthly. What is the maximum amount Mr. Black could withdraw monthly from this account for the next 6 years?

7. Over 7 years, Mr. Orange is paying back the money he borrowed to start a fruit orchard. If his quarterly payments are $855.30, on a loan gathering interest at 7.5%, compounded quarterly, what was the original value of the loan?

How much does Mr. Orange end up actually paying for the loan?

8. Mr. Blue wants to make the most money he can in 10 years' time. Calculate the money generated in these two scenarios, including both **final account values** and **interest generated**, to determine which one will earn Mr. Blue the most money.

Scenario 1:
Quarterly payments of $1050, at 10.2% annual interest, compounded quarterly

Scenario 2:
Monthly payments of $500, at 7.2% annual interest, compounded monthly