

Math Review Questions

Pre-Calculus

11



"Whatever your difficulties in mathematics, I can assure you mine are greater" **Albert Einstien**

Order of Operations: Review

What is an operation?

"Operation" means things like

But, when you see ... $7 + (6 \times 5^2 + 3)$... which part should you calculate first?

What is the Order of Operations?

B.E.D.M.A.S

$$7 + (6 \times 5^2 + 3) \quad - \quad \text{Brackets first!}$$

$$7 + (6 \times 25 + 3) \quad - \quad \text{BEDMAS IN BRACKETS}$$

$$7 + (150 + 3)$$

$$7 + (153)$$

$$7 + 153 = 160$$

Evaluate:

$$1) \quad 3 \times 2 - 5(4 - 3 \times 2)^3 + 1$$

$$6 - 5(4 - 6)^2 + 1$$

$$6 - 5(-2)^3 + 1$$

$$6 - 5(-8) + 1$$

$$6 + 40 + 1$$

$$47$$

47

$$2) \quad 2 - 2(-4 - 3 \times 2)^2(2)$$

$$2 - 2(-4 - 6)^2(2)$$

$$2 - 2(-10)^2(2)$$

$$2 - 2(100)(2)$$

$$2 - 400$$

$$-398$$

-398

$$3) \quad 8 \div (2 - 4)(9 - 5 \times 2)^3 + 1$$

$$8 \div (-2)(9 - 10)^3 + 1$$

$$(-4)(-1) + 1$$

$$4 + 1$$

$$5$$

5

$$4) \quad -5 \times 2 - 4(2 - 3 \times 2)^2 - 4$$

$$-10 - 4(2 - 6)^2 - 4$$

$$-10 - 4(-4)^2 - 4$$

$$-10 - 4(16) - 4$$

$$-10 - 64 - 4$$

$$-78$$

-78

$$5) \quad 5 - 2(-(-4 + 3) \times 2)^2 \times 10$$

$$5 - 2(-(-1) \times 2)^2 \times 10$$

$$5 - 2(2)^2 \times 10$$

$$5 - 2(4) \times 10$$

$$5 - 80$$

$$-75$$

-75

$$6) \quad 12 \div (6 - 4)(-9 + 5 \times 2)^3 - 100$$

$$12 \div (2)(-9 + 10)^3 - 100$$

$$6(+1)^3 - 100$$

$$6(+1) - 100$$

$$6 - 100$$

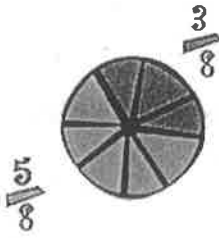
$$-94$$

-94

Fractions: Review

What is a fraction?

part of a whole



Parts of a fraction:

$$\frac{3}{8}$$

numerator
denominator

What are the types of fractions?

MIXED

$$1 \frac{1}{3}$$

IMPROPER

$$\frac{3}{2}$$

stays improper unless specified.

How do you add/subtract fractions?

In order to add or subtract fractions, you must have a

Step 1:	Look to see if you can reduce any fractions and/or make switch mixed fractions into improper fractions
Step 2:	Identify the lowest common denominator (LCD) to make the bottoms the same
Step 3:	Add/Subtract the numerator together, keeping the denominator the SAME .
Step 4:	Simplify the Fraction by reducing if possible.

Evaluate:

$$\frac{5}{6} + \frac{2}{4}$$

$$\frac{5 \times 4}{6 \times 4} + \frac{2 \times 6}{4 \times 6}$$

$$= \frac{20}{24} + \frac{12}{24} = \frac{32}{24} = \frac{4}{3}$$

$$2\frac{1}{3} - 4\frac{2}{5}$$

$$\frac{7 \times 5}{3 \times 5} - \frac{22 \times 3}{5 \times 3}$$

$$= \frac{35}{15} - \frac{66}{15}$$

$$= \frac{-31}{15}$$

Evaluate

$$1\frac{2}{3} + \frac{4}{5} = \frac{5}{3} + \frac{4}{5}$$

$$= \frac{25}{15} + \frac{12}{15}$$

$$= \frac{37}{15}$$

$$\frac{37}{15}$$

8) $\frac{2}{3} - \frac{4}{5}$

$$= \frac{10}{15} - \frac{12}{15}$$

$$= \frac{-22}{15}$$

$$\frac{-22}{15}$$

9) $-2\frac{2}{3} + \frac{4}{5}$

$$= -\frac{8}{3} + \frac{4}{5}$$

$$= \frac{-40}{15} + \frac{12}{15} = \frac{-28}{15}$$

$$\frac{-28}{15}$$

10) $3\frac{1}{7} - \frac{4}{3}$

$$= \frac{22}{7} - \frac{4}{3}$$

$$= \frac{66}{21} - \frac{28}{21} = \frac{38}{21}$$

$$\frac{38}{21}$$

11) $\frac{3}{8} - \frac{2}{9}$

$$= \frac{27}{72} - \frac{16}{72}$$

$$= \frac{11}{72}$$

$$\frac{11}{72}$$

12) $-3\frac{1}{6} - \frac{4}{9}$

$$= -\frac{19}{6} - \frac{4}{9}$$

$$= \frac{-57}{18} - \frac{8}{18} = \frac{-65}{18}$$

$$\frac{-65}{18}$$

How do you Multiply fractions?

numerator x numerator
denominator x denominator

JUST DO IT !!

Evaluate:

$$\frac{5}{6} \times \frac{2}{3} = \frac{5 \times 2}{6 \times 3} = \frac{10}{18} = \frac{5}{9}$$

How do you Divide fractions?

multiply by reciprocal!

Step 1:	Take the reciprocal of the second fraction. (Flip the fraction <u>after</u> the division sign)
Step 2:	Change the sign to multiply, and multiply. Don't forget to reduce!

Evaluate:

$$\frac{-2}{3} \div \frac{2}{5}$$

$$\frac{-2}{3} \times \frac{5}{2} = \frac{-10}{6}$$

$$= \frac{-5}{3}$$

How do you simplify a fraction first?

$$\frac{-12}{30} \div \frac{24}{50}$$

$$-\frac{2}{5} \div \frac{12}{25}$$

$$\frac{1}{18} \times \frac{25}{12} = \frac{25}{216}$$

$$-\frac{5}{6}$$

$$-2\frac{1}{5} \div 1\frac{3}{4}$$

$$-\frac{11}{5} \div \frac{7}{4}$$

$$-\frac{11}{5} \times \frac{4}{7} = -\frac{44}{35}$$

13) $\frac{5}{4} \times \frac{3}{2}$

$$\frac{15}{8}$$

$$\frac{15}{8}$$

14) $\frac{3}{2} \times \frac{5}{4} = \frac{15}{8}$

$$+\frac{15}{8}$$

$$\frac{15}{8}$$

15) $\frac{2}{3} \div \frac{36}{30}$

$$-\frac{2}{3} \times \frac{30}{36} = -\frac{10}{18} = -\frac{5}{9}$$

$$-\frac{5}{9}$$

16) $\frac{5}{4} \times \frac{25}{24} = \frac{125}{96}$

$$-\frac{5}{4}$$

$$-\frac{5}{4}$$

17) $-\frac{9}{4} \div 1\frac{1}{2} = \frac{3}{2}$

$$-\frac{9}{4} \times \frac{2}{3}$$

$$-\frac{18}{12} = -\frac{3}{2}$$

$$-\frac{3}{2}$$

18) $\left(\frac{5}{4}\right)^2 \div \frac{5}{8}$

$$\frac{25}{16} \times \frac{8}{8} = \frac{25}{16}$$

$$\frac{5}{2}$$

$$\frac{5}{2}$$

19) $\left(\frac{9}{2}\right)^2 \div 3\frac{3}{2} = \frac{9}{2}$

$$\frac{81}{4} \times \frac{2}{9} = \frac{9}{2}$$

$$\frac{9}{2}$$

$$\frac{9}{2}$$

20) $-\frac{3}{14} \left(\frac{1}{6} - \frac{2}{9}\right)$

$$-\frac{3}{14} \left(\frac{3}{18} - \frac{4}{18}\right)$$

$$-\frac{3}{14} \left(-\frac{1}{18}\right) = \frac{1}{84}$$

$$\frac{1}{84}$$

21) $-\frac{2}{5} \left(\frac{7}{2} - \frac{6}{4}\right)$

$$-\frac{2}{5} \left(\frac{14}{4} - \frac{6}{4}\right)$$

$$-\frac{2}{5} \left(\frac{8}{4}\right)$$

$$-\frac{16}{20} = -\frac{4}{5}$$

$$-\frac{4}{5}$$

22) $-3 + \frac{10}{6} \times \frac{8}{12}$

$$-3 + \frac{40}{36} = -3 + \frac{10}{9}$$

$$-\frac{3}{1} + \frac{10}{9}$$

$$-\frac{27}{9} + \frac{10}{9} = -\frac{17}{9}$$

$$-\frac{17}{9}$$

23) $\left(\frac{5}{3}\right)^2 - \frac{12}{20}$

$$\frac{25}{9} - \frac{12}{20} = \frac{125}{45} - \frac{27}{45} = \frac{98}{45}$$

$$\frac{125}{45} - \frac{27}{45} = \frac{98}{45}$$

$$\frac{98}{45}$$

24) $2\frac{2}{5} - \left(\frac{7}{6} \div \frac{21}{12}\right)^2$

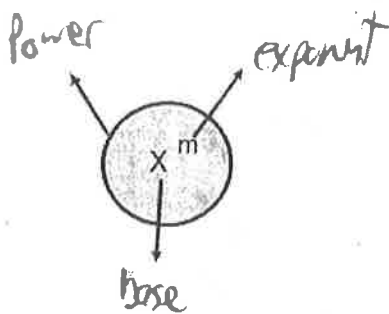
$$\frac{12}{5} - \left(\frac{17}{18} \times \frac{2}{21}\right)^2$$

$$\frac{12}{5} - \left(\frac{2}{3}\right)^2$$

$$\frac{12}{5} - \frac{4}{9} = \frac{108}{45} - \frac{20}{45} = \frac{88}{45}$$

$$\frac{88}{45}$$

is an Exponent?



What are the operation rules for exponents?

The Exponent Laws:

Product Law

$$(x^m)(x^n) = x^{m+n}$$

Power of a Power Law

$$(x^m)^n = x^{m \cdot n}$$

Quotient Law

$$(x^m)/(x^n) = x^{m-n}$$

Zero Exponent Law

$$x^0 = 1$$

Power of a Product Law

$$(xy)^n = x^n y^n$$

Negative Exponent Law

$$x^{-1} = \frac{1}{x}$$

Power of a Quotient Law

$$(x/y)^n = \frac{x^n}{y^n}$$

Evaluate:

a) $3^3 \cdot 3^4$
 3^7

b) $\frac{4^3}{4^2}$
 $4^1 = 4$

c) $(2^4)^3$
 2^{12}

d) $(x^3)(x^4)$
 x^7

e) $\frac{b^3}{b^2}$
 $b^1 = b$

f) $(r^5)^3$
 r^{15}

g) $(x^0)(3^0)$
 $(1)(1)$
 3

h) r^{-5}
 $\frac{1}{r^5}$

i) $\frac{b^2}{b^4}$
 $b^{-2} = \frac{1}{b^2}$

Evaluate:

25) $(3m^5)(4m^6)$

$$12m^{11}$$

$$12m^{11}$$

26) $(-3m^2)(-m^2)$

$$3m^4$$

$$3m^4$$

27) $\frac{m^5 m^3}{m^4}$

$$\frac{m^8}{m^4} = m^4$$

$$m^4$$

28) $\frac{m^{50} m^3}{m^{40}}$

$$\frac{m^{53}}{m^{40}} = m^{13}$$

$$m^{13}$$

29) $\frac{m^2 m^7}{m^5}$

$$\frac{m^9}{m^5} = m^4$$

$$m^4$$

30) $\frac{m^5 m^3}{m^4} \times \frac{m^2 m^4}{m^3}$

$$\frac{m^8}{m^4} \times \frac{m^6}{m^3}$$

$$\frac{m^{14}}{m^7} = m^7$$

$$m^7$$

31) $\frac{m^5 (m^8)^2 (m^5)^2}{m^3}$

$$\frac{m^5 \cdot m^{16} \cdot m^{10}}{m^3}$$

$$\frac{m^{31}}{m^3} = m^{28}$$

$$m^{28}$$

32) $\frac{4m^5 m^3 (m^3)^2}{6m^3 (m^2)^2}$

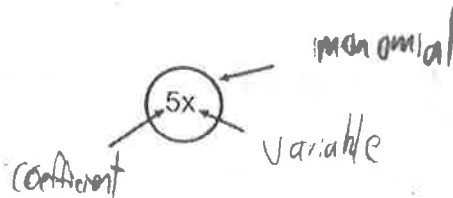
$$\frac{4m^8 m^6}{6m^3 m^4} = \frac{4m^{14}}{6m^7}$$

$$= \frac{2}{3} m^7$$

$$\frac{2m^7}{3}$$

What is a Polynomial?

A monomial is a number, a variable or a combination of these together that form a single term.



A polynomial is an expression formed by adding or subtracting monomials together.

$$(3x^3) + (2x^2) - 7x + 5x$$

$$5x^2 - 2x$$

What is a Like term?

$$3x + 5x = 8x$$

$$(-2x + 4y) - (3x + 7y) = -5x + 11y$$

$$(5a^2 - 6a) - (2a^2 + 10a) = 3a^2 - 4a$$

How do we add/subtract polynomials?

$$(x^2 - 4x + 7) + (3x^2 - 5x - 10)$$

$$\cancel{x^2} - \cancel{4x} + 7 + \cancel{3x^2} - \cancel{5x} - 10$$

$$4x^2 - 9x - 3$$

$$(5x^2 - 2x + 13) - (3x^2 - 9x + 8)$$

$$\cancel{5x^2} - \cancel{2x} + 13 - \cancel{3x^2} + \cancel{9x} - 8 = 2x^2 + 7x + 5$$

How do we multiply polynomials?

$$(a + 4)(a - 1) =$$

F.O.I.L

$$a^2 + 4a - a - 4$$

$$a^2 + 3a - 4$$

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

$$15x^2 - 24xy$$

Evaluate:

33) $(a+1)(a-2)$

$$a^2 - 2a + a - 2$$

$$a^2 - a - 2$$

$$a^2 - a - 2$$

34) $(b+4)(b+5)$

$$b^2 + 4b + 5b + 20$$

$$b^2 + 9b + 20$$

$$b^2 + 9b + 20$$

35) $(c-11)(c-3)$

$$c^2 - 11c - 3c + 33$$

$$c^2 - 14c + 33$$

$$c^2 - 14c + 33$$

36) $(d+10)(d+5)$

$$d^2 + 10d + 5d + 50$$

$$d^2 + 15d + 50$$

$$d^2 + 15d + 50$$

37) $(x-5)^2$

$$(x-5)(x-5)$$

$$x^2 - 5x - 5x + 25$$

$$x^2 - 10x + 25$$

$$x^2 - 10x + 25$$

38) $(x+1)^2$

$$x^2 + 1x + 1x + 1$$

$$x^2 + 2x + 1$$

$$x^2 + 2x + 1$$

39) $(x-5y)(x+5y)$

$$x^2 - 5xy + 5xy + 25y^2$$

$$x^2 - 25y^2$$

$$x^2 - 25y^2$$

40) $(3x+10y)(3x-10y)$

$$9x^2 - 30xy + 30xy - 100y^2$$

$$9x^2 - 100y^2$$

$$9x^2 - 100y^2$$

What is a common factor?

A common factor is either a number or variable that is common in a polynomial.

$$2a + 10$$

$$2(a+5)$$

$$3x^2 + 5x$$

$$x(3x+5)$$

How do you factor a Trinomial?

$$x^2 + 10x + 16 =$$

$$\underline{8} \times \underline{2} = 16$$

$$\underline{8} + \underline{2} = 10$$

$$(x+8)(x+2)$$

$$x^2 - 46x + 45 =$$

$$\underline{-45} \times \underline{-1} = 45$$

$$\underline{-45} + \underline{-1} = -46$$

$$(x-45)(x-1)$$

Factor:

$x^2 - 46x + 45$

$(x - 45)(x - 1)$

$(x - 45)(x - 1)$

42) $x^2 - 9x - 36$

$(x - 12)(x + 3)$

$(x - 12)(x + 3)$

43) $x^2 + 6x - 16$

$(x + 8)(x - 1)$

$(x + 8)(x - 2)$

44) $b^2 - 5ab - 24a^2$

$(b - 8a)(b + 3a)$

$(b - 8a)(b + 3a)$

45) $w^2 - 7wx - 44x^2$

$(w - 11x)(w + 4x)$

$(w - 11x)(w + 4x)$

46) $g^2 + 11gh - 12h^2$

$(g + 12h)(g - h)$

$(g + 12h)(g - h)$

How do you
factor a
Trinomial?

$2x^2 + 3x + 1 =$

$(2x + 1)(x + 1)$

Guess + Check
ORDecomp.

$3x^2 + 4x - 4 =$

$(3x - 2)(x + 2)$

63) $2x^2 + 12x + 10$

$$2(x^2 + 6x + 5)$$

$$2(x+5)(x+1)$$

$$2(x+5)(x+1)$$

64) $5x^2 + 13x + 6$

$$(5x^2 + 10x) + 3x + 6$$

$$5x(x+2) + 3(x+2)$$

$$(5x+3)(x+2)$$

$$(5x+3)(x+2)$$

65) $-10x^2 + 20x + 150$

$$-10(x^2 - 2x - 15)$$

$$-10(x-5)(x+3)$$

$$-10(x-5)(x+3)$$

66) $2x^2 + 3x + 1$

$$(2x+1)(x+1)$$

$$(2x+1)(x+1)$$

67) $2x^2 + 11x + 5$

$$(2x+1)(x+5)$$

$$(2x+1)(x+5)$$

68) $3x^2 + 16x + 5$

$$(3x+1)(x+5)$$

$$(3x+1)(x+5)$$

How do you
factor a
Difference of
Squares?

$$x^2 - 4 =$$

$$(x-2)(x+2)$$

$$4x^2 - 25 =$$

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

69) $4x^2 - y^2$

$$(2x-y)(2x+y)$$

$$(2x-y)(2x+y)$$

70) $9x^2 - 16y^2$

$$(3x-4y)(3x+4y)$$

$$(3x-4y)(3x+4y)$$

71) $81x^2 - 144y^2$

$$(9x-12y)(9x+12y)$$

$$(9x-12y)(9x+12y)$$

72) $x^4 - 16$

$$(x^2-4)(x^2+4)$$

$$(x-2)(x+2)(x^2+4)$$

$$(x-2)(x+2)(x^2+4)$$

73) $x^4 - y^4$

$$(x^2-y^2)(x^2+y^2)$$

$$(x-y)(x+y)(x^2+y^2)$$

$$(x-y)(x+y)(x^2+y^2)$$

74) $81 - y^4$

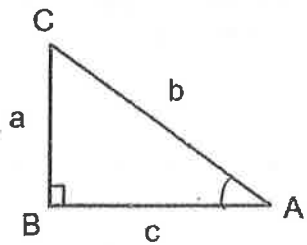
$$(9-y^2)(9+y^2)$$

$$(3-y)(3+y)(9+y^2)$$

$$(3-y)(3+y)(9+y^2)$$

Right Angled Trigonometry

What are the three primary trigonometric ratios?



SOH CAH TOA

$$\sin A = \frac{a}{b}$$

$$\cos A = \frac{c}{b}$$

$$\tan A = \frac{a}{c}$$

$$\sin C = \frac{c}{b}$$

$$\cos C = \frac{a}{b}$$

$$\tan C = \frac{a}{c}$$

Example 1

Determine the value of x to the nearest tenth.

a) $\sin x = \frac{2}{3}$

$$\sin^{-1}\left(\frac{2}{3}\right) = 41.8^\circ$$

b) $\cos 32^\circ = \frac{x}{13}$

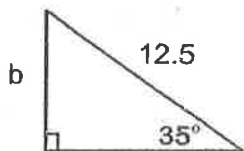
$$13 \cos 32^\circ = 11.0$$

c) $\tan 15^\circ = \frac{6}{x}$

$$x = \frac{6}{\tan 15^\circ} = 22.4^\circ$$

Example 2

Find the length of the indicated side, to the nearest tenth



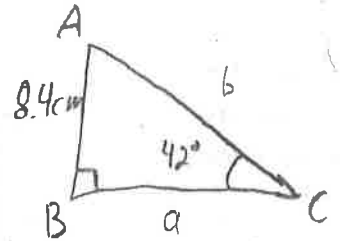
$$\sin 35^\circ = \frac{b}{12.5}$$

$$b = 12.5 \cdot \sin 35^\circ$$

$$= 7.17$$

Example 3

In $\triangle ABC$, $\angle B = 90^\circ$, $\angle C = 42^\circ$, and $c = 8.4$ cm. Solve the triangle, rounding side lengths to the nearest tenth of a centimetre.



$$\angle A = 90^\circ - 42^\circ = 48^\circ$$

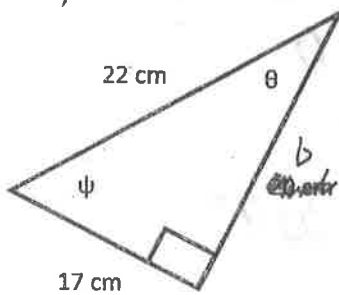
$$\tan 42^\circ = \frac{8.4}{a}$$

$$a = \frac{8.4}{\tan 42^\circ} = 9.3 \text{ cm}$$

$$\sin 42^\circ = \frac{8.4}{b}$$

$$b = \frac{8.4}{\sin 42^\circ} = 12.6 \text{ cm}$$

59) Solve the following triangle. Show all your work.



$$\sin \theta = \frac{17}{22}$$

$$\theta = \sin^{-1}\left(\frac{17}{22}\right)$$

$$= 50.6^\circ$$

$$\psi = 90^\circ - 50.6^\circ$$

$$= 39.4^\circ$$

$$a^2 + b^2 = c^2$$

$$b^2 = c^2 - a^2$$

$$b = \sqrt{22^2 - 17^2}$$

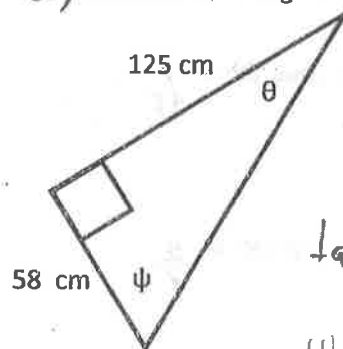
$$b = 13.964$$

$$= 14$$

~~13.964~~

$$b = 14 \text{ cm} \quad \theta = 50.6^\circ \quad \psi = 39.4^\circ$$

60) Solve the following triangle. Show all your work.



$$\tan \psi = \frac{125}{58}$$

$$\psi = \tan^{-1}\left(\frac{125}{58}\right)$$

$$= 65.1^\circ$$

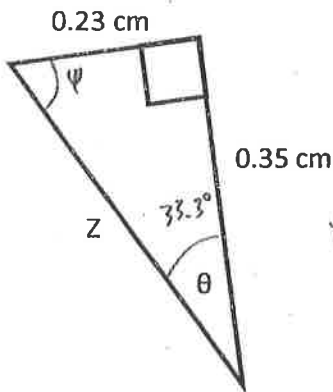
$$\theta = 90^\circ - 65.1^\circ = 24.9^\circ$$

$$\sqrt{58^2 + 125^2} = c$$

$$c = 137.8 \text{ cm}$$

65.1°, 24.9°, 137.8 cm

61) Solve the following triangle.



$$\tan \theta = \frac{0.23}{0.35}$$

$$\theta = \tan^{-1} \left(\frac{0.23}{0.35} \right)$$

$$= 33.3^\circ$$

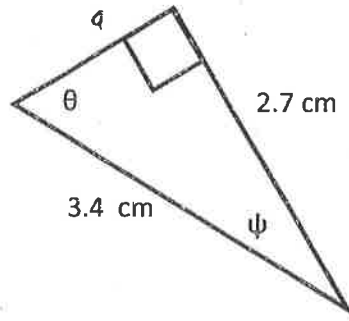
$$\psi = 90 - 33.3^\circ = 56.7^\circ$$

$$z = \sqrt{(0.23)^2 + (0.35)^2} = 0.4188$$

$$= 0.42 \text{ cm}$$

56.7°, 33.3°, 0.42 cm

62) Solve the following triangle.



$$\cos \psi = \frac{2.7}{3.4}$$

$$\psi = \cos^{-1} \left(\frac{2.7}{3.4} \right)$$

$$= 37.4^\circ$$

$$\theta = 90^\circ - 37.4^\circ = 52.6^\circ$$

$$a = \sqrt{3.4^2 - 2.7^2} = 2.06639$$

$$= 2.1 \text{ cm}$$

37.4°, 52.6°, A = 2.1 cm

63) In ΔABC , angle $A = 90^\circ$, angle $C = 38^\circ$ and $c = 16.7$ cm. Solve the triangle.

$$B = 90^\circ - 38^\circ = 52^\circ$$

$$\tan 38^\circ = \frac{16.7}{b}$$

$$b = \frac{16.7}{\tan 38^\circ}$$

$$= 21.375$$

$$= 21.4 \text{ cm}$$

$$a = \sqrt{21.4^2 + 16.7^2}$$

$$= 27.144$$

$$= 27.1$$

$a = 27.1$, $b = 21.4$, angle $B = 52^\circ$

64) In ΔABC , angle $A = 90^\circ$, angle $B = 27^\circ$ and $c = 28.7$ cm. Solve the triangle.

$$C = 90 - 27 = 63^\circ$$

$$\tan 27^\circ = \frac{b}{28.7 \text{ cm}}$$

$$b = (28.7)(\tan 27^\circ)$$

$$= 14.623 = 14.6$$

$$\cos 27^\circ = \frac{28.7}{a}$$

$$a = \frac{28.7}{\cos 27^\circ} = 32.21$$

$$= 32.2$$

$a = 32.2$, $b = 14.6$, angle $C = 63^\circ$

