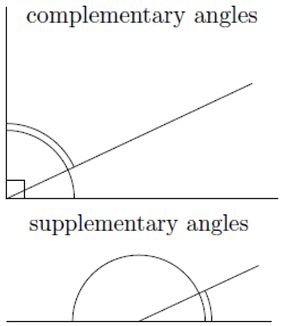
PreCalculus UNIT E

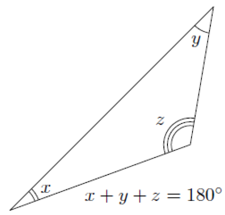
TRIGONOMETRY – journal questions – MPM

Summarize everything you need to know about these topics. Use examples and concise (not long – but with enough detail) explanations. Include definitions and diagrams if necessary

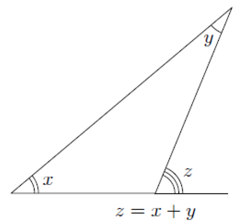
1. FACTS about ANGLES

Copy/Paste the following

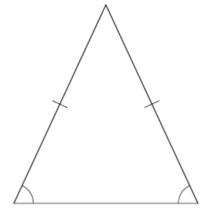




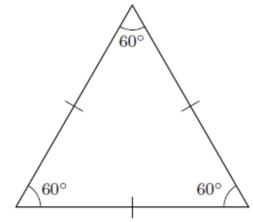
Sum of the angles of **any** triangle is 180°, $x + y + z = 180°$



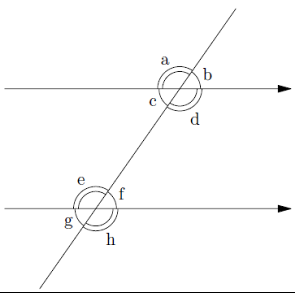
Exterior angle = sum of interior opposite angles, $z = x + y$



Isosceles Triangle
Base angles are equal and Opposite sides equal



Equilateral Triangle
All angles = 60°
All sides equal in length



Angles marked by the same symbol are equal.

X-pattern Vertically opposite angles: $a = d,\ b = c,\ e = h,\ f = g$

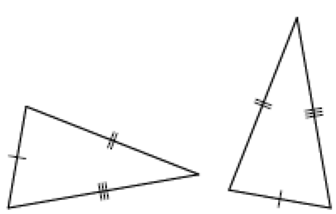
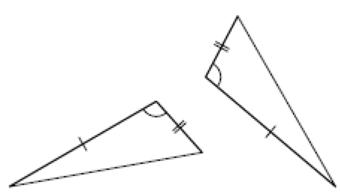
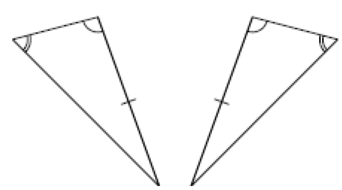
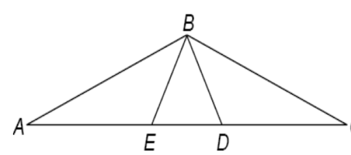
Z-pattern *Alternate angles* $c = f,\ d = e$

F-pattern *Corresponding angles* $a = e,\ c = g,\ b = f,\ d = h$

C-pattern *Co-interior angles:* $\underbrace{c + e}_{\text{supplementary}} = \underbrace{d + f}_{\text{supplementary}} = 180°$

2. CONGRUENT TRIANGLES

a. State the Congruent triangles definition and symbol, then copy/paste the following

SSS Three sides are equal	**SAS** Two pairs of sides and angles between them are equal	**ASA** or **AAS** One pair of sides and two pairs of angles are equal	b. Use congruent triangles to prove the following: **Given:** $\angle ABD \cong \angle EBC$ $\angle A \cong \angle C$ $\overline{BE} \cong \overline{BD}$ **Prove:** $\overline{BA} \cong \overline{BC}$
			

3. SIMILAR TRIANGLES

a. State the Similar triangles definition and symbol, then copy/paste the following

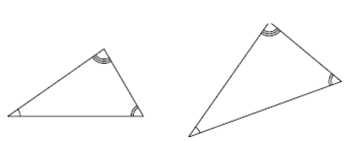
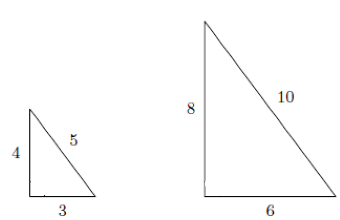
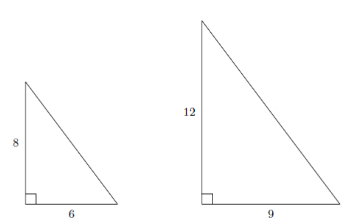
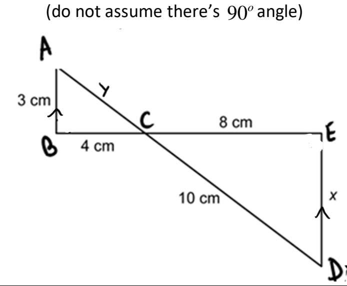
AAA or **AA** Three or even just two angles are equal	**SSS~** Three pairs of sides are proportional.	**SAS~** Two pairs of sides are proportional and angles between them are equal	b. Prove the triangles are similar and then solve for missing sides x and y (do not assume there's 90^o angle)
			

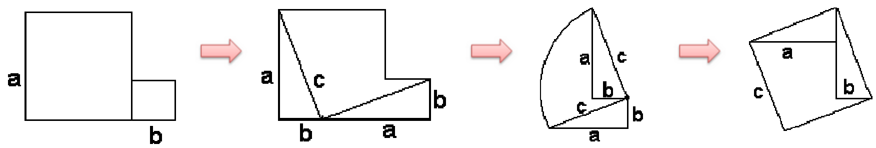
Table of Trigonometric Ratios

Angle	Sine	Cosine	Tangent
1°	.0175	.9998	.0175
2°	.0349	.9994	.0349
3°	.0523	.9986	.0524
4°	.0698	.9976	.0699
5°	.0872	.9962	.0875
6°	.1045	.9945	.1051
7°	.1219	.9925	.1228
8°	.1392	.9903	.1405
9°	.1564	.9877	.1584
10°	.1736	.9848	.1763
11°	.1908	.9816	.1944
12°	.2079	.9781	.2126
13°	.2250	.9744	.2309
14°	.2419	.9703	.2493
15°	.2588	.9659	.2679
16°	.2756	.9613	.2867
17°	.2924	.9563	.3057
18°	.3090	.9511	.3249
19°	.3256	.9455	.3443
20°	.3420	.9397	.3640
21°	.3584	.9336	.3839
22°	.3746	.9272	.4040
23°	.3907	.9205	.4245
24°	.4067	.9135	.4452
25°	.4226	.9063	.4663
26°	.4384	.8988	.4877
27°	.4540	.8910	.5095
28°	.4695	.8829	.5317
29°	.4848	.8746	.5543
30°	.5000	.8660	.5774
31°	.5150	.8572	.6009
32°	.5299	.8480	.6249
33°	.5446	.8387	.6494
34°	.5592	.8290	.6745
35°	.5736	.8192	.7002
36°	.5878	.8090	.7265
37°	.6018	.7986	.7536
38°	.6157	.7880	.7813
39°	.6293	.7771	.8098
40°	.6428	.7660	.8391
41°	.6561	.7547	.8693
42°	.6691	.7431	.9004
43°	.6820	.7314	.9325
44°	.6947	.7193	.9657
45°	.7071	.7071	1.0000

Angle	Sine	Cosine	Tangent
46°	.7193	.6947	1.0355
47°	.7314	.6820	1.0724
48°	.7431	.6691	1.1106
49°	.7547	.6561	1.1504
50°	.7660	.6428	1.1918
51°	.7771	.6293	1.2349
52°	.7880	.6157	1.2799
53°	.7986	.6018	1.3270
54°	.8090	.5878	1.3764
55°	.8192	.5736	1.4281
56°	.8290	.5592	1.4826
57°	.8387	.5446	1.5399
58°	.8480	.5299	1.6003
59°	.8572	.5150	1.6643
60°	.8660	.5000	1.7321
61°	.8746	.4848	1.8040
62°	.8829	.4695	1.8807
63°	.8910	.4540	1.9626
64°	.8988	.4384	2.0503
65°	.9063	.4226	2.1445
66°	.9135	.4067	2.2460
67°	.9205	.3907	2.3559
68°	.9272	.3746	2.4751
69°	.9336	.3584	2.6051
70°	.9397	.3420	2.7475
71°	.9455	.3256	2.9042
72°	.9511	.3090	3.0777
73°	.9563	.2924	3.2709
74°	.9613	.2756	3.4874
75°	.9659	.2588	3.7321
76°	.9703	.2419	4.0108
77°	.9744	.2250	4.3315
78°	.9781	.2079	4.7046
79°	.9816	.1908	5.1446
80°	.9848	.1736	5.6713
81°	.9877	.1564	6.3138
82°	.9903	.1392	7.1154
83°	.9925	.1219	8.1443
84°	.9945	.1045	9.5144
85°	.9962	.0872	11.4301
86°	.9976	.0698	14.3007
87°	.9986	.0523	19.0811
88°	.9994	.0349	28.6363
89°	.9998	.0175	57.2900

4. PYTHAGOREAN THEOREM

a. Copy/Paste the following



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

Use graph paper. Sketch out two any size squares side by side. Cut out the resulting shape as one whole piece.	Count off size b from the bottom of bigger square and connect that point with both corners of the squares, as shown.	Cut along the two lines drawn. Rotate the pieces, to form a bigger square. After you perform this, place the pieces in your journal (create a pocket for these to go into)

b. Give a reason how what you performed visually proves the Pythagorean Theorem.

c. Discuss when to use Pythagorean Theorem as opposed to SOH CAH TOA

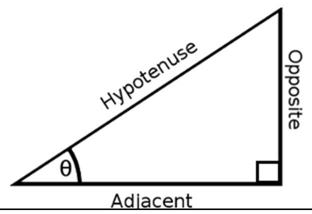
5. SOH CAH TOA

a. Copy/Paste the table of trig ratios from the previous page and the following SOH CAH TOA definitions

SOH $\sin\theta = \dfrac{opp}{hyp}$

CAH $\cos\theta = \dfrac{adj}{hyp}$

TOA $\tan\theta = \dfrac{opp}{adj}$



b. Discuss how to use the trig ratios table and how to use your calculator – do you need to press SIN button before or after angle is entered?

c. What do you need to press to get your calculator into DEGREE mode (later you will learn RADIAN mode too).

d. Explain why the following are written in INCORRECT form and rewrite the correct versions

i. $\sin = \dfrac{3}{5}$

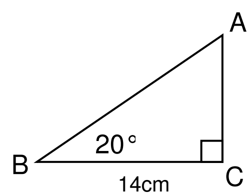
ii. $45^o \cos = \dfrac{5}{x}$

iii. $x = 0.5234 \tan^{-1}$

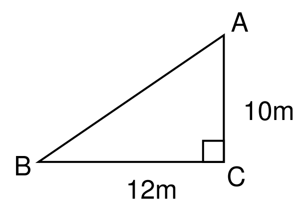
Copy the NOTE:

Do not think that in $\sin 20^o$ *sine and 20º are multiplied! It's more like operation of sine is applied to 20, like in* $\sqrt{20}$ *, operation of root is applied to 20.*

e. Explain and show how to find side AB

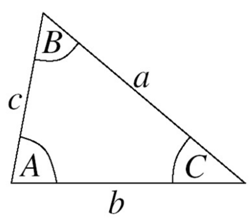


f. Explain and show how to find angle B.



6. SINE and COSINE LAWS

a. Copy/Paste the following



Sine Rule

$$\frac{a}{\sin(A)} = \frac{b}{\sin(B)} = \frac{c}{\sin(C)} \quad \text{or} \quad \frac{\sin(A)}{a} = \frac{\sin(B)}{b} = \frac{\sin(C)}{c}$$

(for finding sides) (for finding angles)

Cosine Rule

$$a^2 = b^2 + c^2 - 2bc\cos(A) \quad \text{or} \quad \cos(A) = \frac{b^2 + c^2 - a^2}{2bc}$$

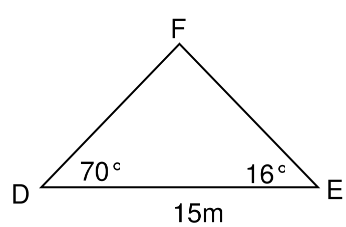
(for finding sides) (for finding angles)

$$b^2 = a^2 + c^2 - 2ac\cos B \qquad \cos B = \frac{a^2 + c^2 - b^2}{2ac}$$

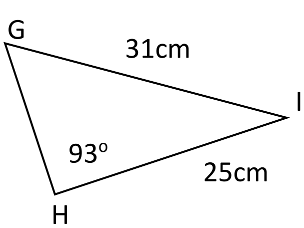
$$c^2 = a^2 + b^2 - 2ab\cos C \qquad \cos C = \frac{a^2 + b^2 - c}{2ab}$$

b. Explain what to do to find the 3rd angle if you know the other two

c. Explain and show how to find side FE



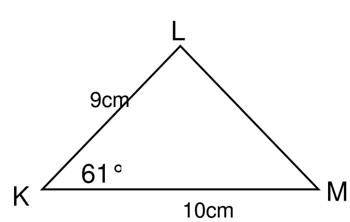
d. Explain and show how to find angle G



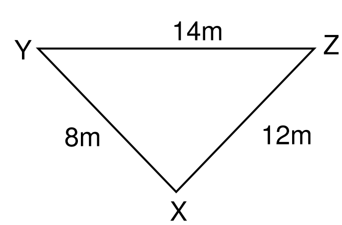
e. Show how to rearrange one version of cosine law to get the other.

h. Record how to use your calculator to do BOTH cosine law computations in least amount of steps.

f. Explain and show how to find side LM

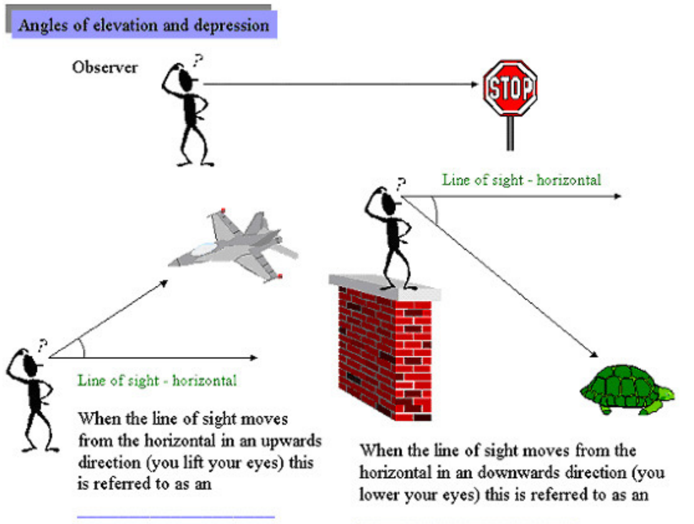


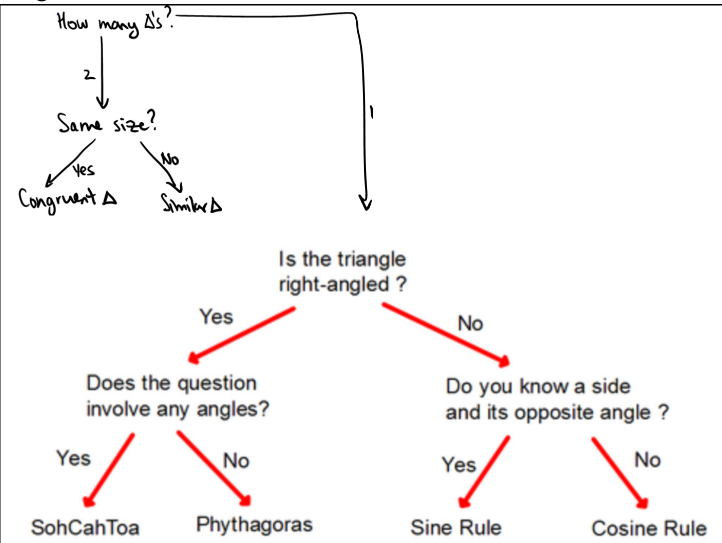
g. Explain and show how to find angle Z



7. WORD PROBLEMS

a. Copy/Paste the following, fill in the blanks in the first diagram!





Draw diagrams for each problem, use the flow chart to set up an equation that would solve the problems. Solve if you wish.

b. In the Old West, settlers made tents out of a piece of cloth thrown over a clothesline and then secured to the ground with stakes forming an isosceles triangle. How long would the cloth have to be so that the opening of the tent was 6 feet high and 8 feet wide?	c. Sandy is trying to measure the height of a nearby flagpole using a mirror placed on the ground between herself and the pole. The mirror is 6m away from the pole and 2m away from Sandy. The height to her eyes is 157cm, from which she can clearly see the top of the flagpole. How many centimeters tall is the flagpole?	d. An airplane takes off from a runway near some mountains. The peak of the mountain is on the flight path 2.5 km from the end of the runway. The mountain is 2000 m high. What angle of ascent is needed to clear the mountain top?	e. The highest point along a cliff is 80 m above the lakeshore. A surveyor stands on the top of the cliff, looking through a 1.5 m tall transit instrument. He spots a boat out on the lake, at an angle of depression of 38°. How far, to the nearest tenth of a metre, is it from the boat to the base of the cliff?
f. A 4m flag pole is not standing up straight. There is a wire attached to the top of the pole and anchored in the ground to counteract the lean of the pole. The wire is 4.17m long. The wire makes a 68° angle with the ground. What angle does the flag pole make with the ground?	g. A cottage under construction is to be 10.3 m wide. The two sides of the roof are to be equal and supported by rafters that meet at the top at an angle of 45°. How long should the roof rafters be?	h. A golfer hits a tee shot on a 350 m long straight golf hole. The ball is sliced (hit at an angle) 21° to the right. The ball lands 210 m away from the tee. How far is the ball from the hole to the nearest metre?	i. The posts of a hockey goal are 2 m apart. A player tries to score a goal by shooting the puck along the ice from a point 7.1 m from one post and 6.4 m from the other. Within what angle must the player shoot the puck?