Accelerated Precalculus

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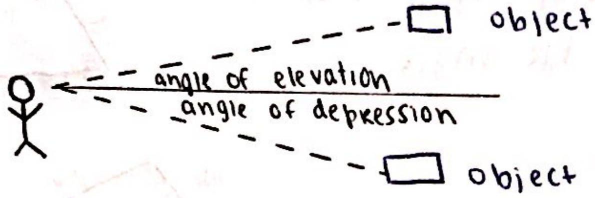
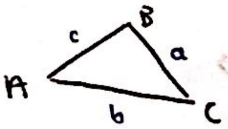
1-21-18
3RD

TRIG Applications Study Guide
Unit 7

I.) Word Problems



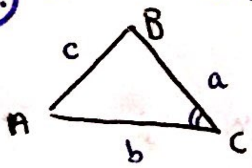
II) Law of Sines



in ΔABC $\quad \dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

- used to find missing sides / angles of A-S-A or A-A-S triangles
- won't give obtuse angles

III.) Law of Cosines

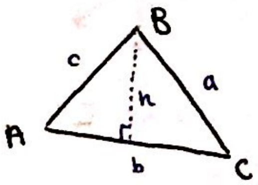


in ΔABC

$$c^2 = a^2 + b^2 - 2ab\cos C$$

- used for S-A-S triangles
- will give obtuse angles

IV) Area of a triangle



$A = \frac{1}{2}bh$
$= \frac{1}{2}b(c\sin A)$

in ΔABC $\quad A = \frac{1}{2}bc\sin A$

- For the area of a S-S-S triangle use Hero's formula

$$A = \sqrt{s(s-a)(s-b)(s-c)}$$

where $s =$ the semiperimiter
$s = \frac{1}{2}(a+b+c)$

V. The Ambiguous Case

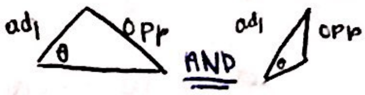
- sometimes when given an Angle-side-side (A-S-S) triangle, there can be one triangle, two triangles, or NO triangles

1. If opp (h) = adj $\cdot \sin\theta$
   1 Right triangle

2. If opp $\geq$ adj
   1 triangle

3. If opp $<$ adj $\cdot \sin\theta$
   NO triangles

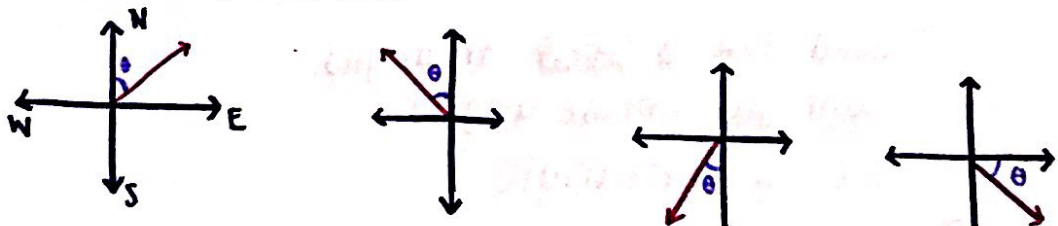
4. If adj $\cdot \sin\theta <$ opp $<$ adj
   2 triangles



- solve using quadratics
  - ↳ can use program in calculator to help

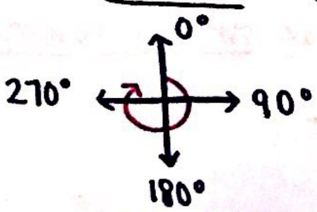
VI. Bearings and Headings

bearing: an acute angle from the N-S line towards east or west directions



N θ°E   N θ°W   S θ°W   S θ°E

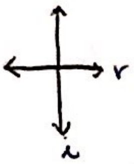
heading: always drawn from the north line in a clockwise direction



- solve for bearings / headings (direction) and / or magnitude (how far
- * Remember: alternate interior angles are congruent w parallel lines

VII. Polar / Trig Form of complex numbers

the imaginary plane:



x axis: real numbers

y axis: imaginary numbers

absolute value of a complex number

$$z = a + bi$$

$$|a+bi| = \sqrt{a^2+b^2}$$ = the distance to the origin or the radius "r"

trig form of a complex number:

In $z = a + bi$

$$\boxed{z = r(\cos\theta + i\sin\theta)}$$

where $r = \sqrt{a^2+b^2}$ and $\theta = \tan^{-1}\left(\frac{b}{a}\right)$

theorems:

If: $z_1 = r_1(\cos\theta_1 + i\sin\theta_1)$

$z_2 = r_2(\cos\theta_2 + i\sin\theta_2)$

I. multiply

$$z_1 * z_2 = r_1 r_2 [\cos(\theta_1+\theta_2) + i\sin(\theta_1+\theta_2)]$$

II. divide

$$\frac{z_1}{z_2} = \frac{r_1}{r_2}[\cos(\theta_1-\theta_2) + i\sin(\theta_1-\theta_2)]$$

III. raise to the nth power

$$z^n = r^n(\cos(n\theta) + i\sin(n\theta))$$

→ to get from polar form to standard form use calculator & expand

→ NOTE: abbreviation "cis" = $\cos\theta + i\sin\theta$

VIII) Trig Applications with Geometry

- be able to solve problems from the geometry with trig applications worksheet

IX) De Moivre's Theorem

the n nth roots of

$r\ \cos\theta + i\sin\theta$ or $r\ \text{cis}\ \theta =$

$$\sqrt[n]{r}\ \text{cis}\left(\frac{\theta}{n} + \frac{360}{n \cdot k}\right)$$

→ first: always convert from standard form to polar / trig form

→ sketching the roots will form shapes
3 roots = equilateral triangle, 4 roots = square, etc

→ if it gives you one root of k & asks you for the other roots....

1) find k

$r^n\ \text{cis}\ (\theta * n)$

ex) if it says that the root is one of the cube roots of k, then cube the radius and multiply the angle by 3.

2) use de moivre's theorem to find other roots.

→ pay attention if it asks for your answer in STANDARD form or POLAR form

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