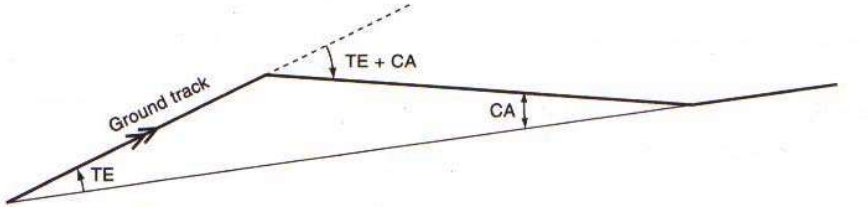
THE 1 IN 60 RULE
AND GENERAL MATHEMATICS

Every CAA ATP Navigation paper will normally have one or two questions requiring the use of the 1 in 60 rule or general mathematics in order to derive an answer.

THE 1 IN 60 RULE

The 1 in 60 rule is a simplified way to calculate an aircraft's drift angle in flight. If an aircraft has drifted 1 nm. off track after 60 nm's, its drift angle is 1°.



FORMULA

$$\frac{\text{ERROR}}{\text{DISTANCE}} \times \frac{60}{1} = \text{DRIFT ANGLE}$$

$$\frac{1}{60} \times \frac{60}{1} = 1°$$

EXAMPLE

A to B 476 nm's. Track 090° T. The aircraft departs position A and maintaining a heading of 090° T. After 157 nm's, the aircraft is 11 nm's left of track.

i) What is the new heading to steer to regain track at point B?

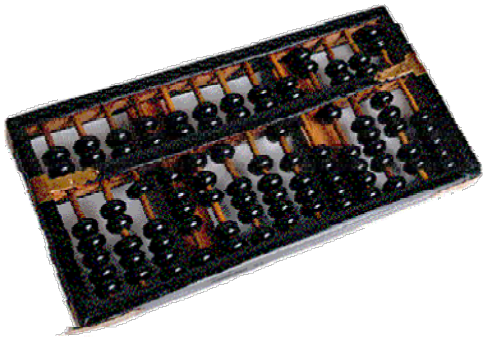
ii) What is the new track to point B?

$$\frac{11}{157} \times \frac{60}{1} = 4.2° \qquad \frac{11}{319} \times \frac{60}{1} = 2°$$

i) The new heading to B is : 090° + 4.2° + 2° = <u>096.2° T</u>

ii) The new track to B is : 090° + 2° = <u>092° T</u>

GENERAL MATHEMATICS



The questions requiring the use of general mathematics normally involve the use of the COSINE RULE and/or the formulae for determining the RADIUS, DIAMETER or CIRCUMFERENCE of a CIRCLE.

THE COSINE RULE

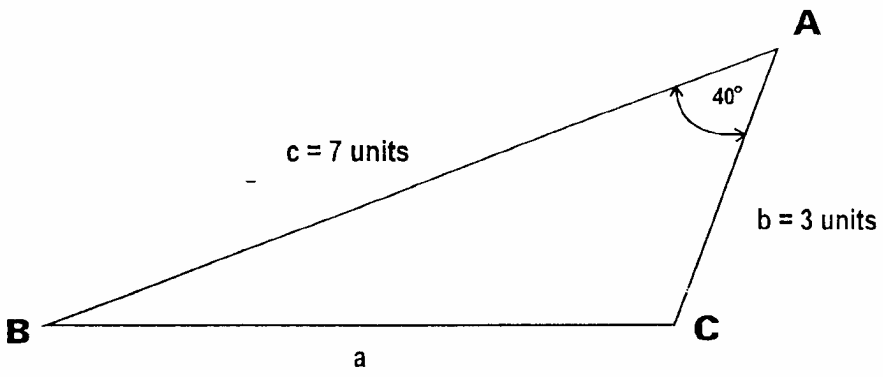
The COSINE RULE is used in NON-RIGHT ANGLED TRIANGLES when given the length of two sides and one angle and the unknown is the length of the side opposite the known angle or when given the length of all three sides and the unknown is any angle.

FORMULA

$a^2 = b^2 + c^2 - 2bc \cos A$

Naturally, this formula can be arranged in any other fashion to isolate the unknown.

EXAMPLE



Solve the length of Side a.

$a^2 = b^2 + c^2 - 2bc \cos A$

$a^2 = 3^2 + 7^2 - (2 \times 3 \times 7 \times \cos 40)$

$a^2 = 9 + 49 - 32{,}17$

$a^2 = 25{,}83$

$a = \sqrt{25{,}83}$

$a = 5{,}08$ UNITS

THE CIRCLE

Various questions may be asked relating to the radius, diameter or circumference of a circle.

FORMULA

d (diameter)	=	$2r$
c (circumference)	=	$2\pi r$
c (circumference)	=	πd

EXAMPLE

If the radius of a circle is 7 units, determine its circumference?

c	=	$2\pi r$
	=	$2 \times 3,14 \times 7$
	=	43,96 UNITS

QUESTIONS

1. An aircraft departs from position A on a heading of 247° M in order to fly track 229°T. After 132 nm's, the aircraft is 11 nm's right of the intended track.

   What is the magnetic heading to steer to return to A? (Variation 15° W).

2. With the aircraft's weather radar in the MAP mode, the following observations were made of a ground feature:

UTC	RELATIVE BEARING	RANGE
1205	067º	76
1215	107º	83

   TAS 300 Kts. Heading 143° C. Deviation 3° W. Variation 15° W.

   i) What is the aircraft's groundspeed?

   ii) What is the W/V?

3. An aircraft passes overhead point A on a heading of 270° and commences a rate on turn to the left for 7 minutes W/V 360/25. TAS 300 Kts.

   What is the position of the aircraft as a bearing and distance from the station at the end of the 7 minutes?

4. An airship overhead the equator flies west around the world in 280 HRS. An aircraft also flies west around the world, but in a time of 70 HRS and at 3 times the airships speed.

   At what latitude did the aircraft fly?

   The effect of the altitude of both the airship and the aircraft is negligible.

5. The satellite Oculus follows a polar orbit around the earth at a speed of 2900 km/h at a constant radius from the centre of the earth of 6800 km's. Oculus crosses the equator at longitude 60° W at 1400 LMT on 27 JULY on its northbound passage.

   At what longitude does Oculus cross the equator on its southbound passage and what is the LMT at this point?