National 5 Mathematics

Using Trigonometry - **Solutions** - 2014-2019

Marks are indicated in brackets after each question number

2014 Paper 1 Question 5, (3)

Using the Sine Rule gives

$$\frac{k}{\sin K} = \frac{l}{\sin L}$$

$$\frac{LM}{0.4} = \frac{18}{0.9}$$

$$LM = 0.4\ x\ \frac{18}{0.9}$$

$$LM = 0.4\ x\ 20$$

$$LM = 8$$

2014 Paper 2 Question 10, (3) (2)

a) Using the Cosine Rule, we have

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

$$= \frac{11^2 + 8^2 - 13^2}{2x11x8}$$

$$= 0.09....$$

$$B = cos^{-1}(0.09...)$$

$$= 85°$$

b) Extending the line AB gives 'F' angles with the two North lines, with the 'F' angles being

$60°$ $120°$. So, shaded angle $= 360 - 85 - 120 = 155°$

2015 Paper 2 Question 3, (3)

Using the Cosine Rule gives

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

$(AB)^2 = 1.35^2 + 1.2^2 - 2\ x\ 1.2\ x\ 1.35\ x\cos 35$

$(AB)^2 = 0.613\ldots$

$AB = 0.78$

So, $AB = 0.78\ km$

2015 Paper 2 Question 13, (4)

$PQR = 180 - 128 = 56°$

$QRP = 180 - (52 + 72) = 56°$

Using the Sine Rule gives

$$\frac{q}{\sin Q} = \frac{r}{\sin R}$$

$$\frac{q}{\sin 52°} = \frac{25}{\sin 56°}$$

$$q = \frac{25\sin 52°}{\sin 56°} = 23.67$$

So, distance is 23.67 km

2016 Paper 2 Question 8, (3)

Using the Sine Rule gives

$$\frac{\sin x}{150} = \frac{\sin 66}{140}$$

$$\sin x = \frac{\sin 66}{140}\ x\ 150$$

$\sin x = 0.978\ .\ .\ .$

$x = sin^{-1}(0.978\ldots)$

$x = 78.2°$

2016 Paper 2 Question 16, (4)

Using Pythagoras gives $DE = \sqrt{4^2 - 3^2} = \sqrt{7}$

Using the Sine Rule on ADE gives

$$\frac{\sin A}{a} = \frac{\sin E}{e}$$

$$\frac{\sin A}{\sqrt{7}} = \frac{\sin 90}{4}$$

$$\sin A = \frac{\sqrt{7}\sin 90}{4}$$

$$= 0.661\ldots$$

$$A = sin^{-1}(0.661\ldots)$$

$$= 41°$$

2017 Paper 1 Question 7, (2)

$$\text{Area} = \frac{1}{2} df \sin E$$

$$= \frac{1}{2}\ x\ 12\ x\ 8\ x \frac{2}{3}$$

$$= 32\ cm^2$$

2017 Paper 2 Question 10, (4)

$EDF = 126 - 90 = 36°$

$DEF = 360 - 230 - 90 = 40°$

So, $DFE = 180 - 36 - 40 = 104°$

Using the Sine Rule gives

$$\frac{f}{\sin F} = \frac{e}{\sin E}$$

$$\frac{15}{\sin 104} = \frac{DF}{\sin 40}$$

$$DF = \frac{15\sin 40}{\sin 104}$$

$DF = 9.9$

Distance $= 9.9\ km$

2018 Paper 1 Question 10, (3)

$z^2 = x^2 + y^2 - 2xy\cos Z$

$= 8^2 + 10^2 - 2(8)(10)(\frac{1}{8})$

$= 164 - 20$

$= 144$

$z = 12$

So, $XY = 12$ cm

2018 Paper 2 Question 9, (3)

Using the Sine Rule gives

$$\frac{20}{\sin 37} = \frac{DC}{\sin 105}$$

$$DC = \frac{20\sin 105}{\sin 37}$$

$$= 32 \text{ cm}$$

2018 Paper 2 Question 13, (4)

$$\cos T = \frac{5.6^2 + 10.3^2 - 7.2^2}{2\ x\ 5.6\ x\ 10.3}$$

$$= \frac{85.61}{115.36}$$

$$= 0.742\ .\ .$$

$$T = cos^{-1}(0.742\ ..)$$

$$= 42°$$

$$\text{Bearing} = 240 + 42$$

$$= 282°$$

2018 Paper 2 Question 17, (5)

$$\text{Area of Triangle} = \frac{1}{2}(38)(55)\sin 75$$

$$= 1009.39\ cm^2$$

$$\text{Area of Sector} = \frac{75}{360}\ x\ \pi\ x\ 60$$

$$= 39.27\ cm^2$$

Shaded Area $= 1009.39 - 39.27$

$= 970.12\ cm^2$

2019 Paper 2 Question 3, (2)

Area $= \frac{1}{2}\ x\ 45\ x\ 70\ x \text{Sin} 129°$

$= 1{,}224\ cm^2$

2019 Paper 2 Question 7, (3)

The smallest angle is at vertex Z

Using the Cosine Rule gives

$$Cos\ Z = \frac{8.5^2 + 7.2^2 - 6.3^2}{2\ (8.5)\ (7.2)}$$

$$= \frac{84.4}{122.4}$$

$$Z = cos^{-1}\left(\frac{84.4}{122.4}\right)$$

$$= 46.4°$$