MATHEMATICS

TOPIC: TRIGONOMETRY
GRADE 10

CAPS ALIGNED

TRIGONOMETRY - DEFINITIONS (RIGHT TRIANGLES)

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TRIGONOMETRY– Grade 10

1. Trigonometry

1. Define the trigonometric ratios sin θ, cos θ and tan θ using the right – angled triangle
2. Extend the definitions of sin θ, cos θ and tan θ for $0° \leq \theta \leq 360°$
3. Define the reciprocal of the trigonometric ratios cosec θ, sec θ and cot θ, using the right-angled triangles (these three reciprocals should be examined in Grade 10 only)
4. Derive values of the trigonometric ratios for the special cases (without using a calculator) $\theta \in \{0°, 30°, 45°, 60°, 90°\}$
5. Solve two-dimensional problems involving right-angled triangles (See Term 3)
6. Solve simple trigonometric equations for angles between 0° and 90°
7. Use a diagram to determine the numerical values of ratios for angles from 0° to 360°

2. Trigonometry (2D)

1. Solve two-dimensional problems involving right- angled triangles
2. Problems in two dimensions

3. Examination Guideline

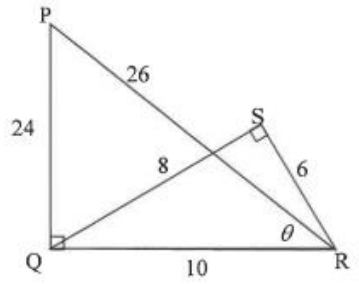
1. The reciprocal ratios cosec θ, sec θ and cot θ will be explicitly tested in all aspects: definitions, function values and equations.
2. While the focus of trigonometric graphs is on the relationships, the characteristics of the graphs will also be examined.

Trigonometry (Definitions) - GRADE 10
Exercises - A

DBE/NOVEMBER 2015

QUESTION 4

ΔPQR and ΔSQR are right-angled triangles as shown in the diagram below.
$PR = 26$, $PQ = 24$, $QS = 8$, $SR = 6$, $QR = 10$ and $P\hat{R}Q = \theta$.



4.1 Refer to the diagram above and, WITHOUT using a calculator, write down the value of:

4.1.1 $\tan \hat{P}$

4.1.2 $\sin S\hat{Q}R$

4.1.3 $\cos\theta$

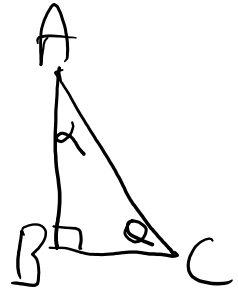
4.1.4 $\sec S\hat{R}Q$

4.2 WITHOUT using a calculator, determine the value of $\dfrac{\cot\theta}{\text{cosec } Q\hat{R}S}$.

Notes

Toolbox

1. SohCahToa



$\sin\alpha = \dfrac{AB}{AC}$

$\cos\alpha = \dfrac{BC}{AC}$

$\tan\alpha = \dfrac{AB}{BC}$

$\sin\alpha = \dfrac{BC}{AC}$

$\cos\alpha = \dfrac{AB}{AC}$

$\tan\alpha = \dfrac{BC}{AB}$

Trigonometry (Definitions) - GRADE 10
Exercises - A

Exercise A

QUESTION 4

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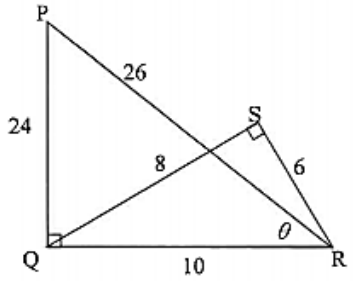

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Notes

② Reciprocal of trigonometric ratios

$\text{Cosec}\,\theta = \dfrac{1}{\sin\theta}$

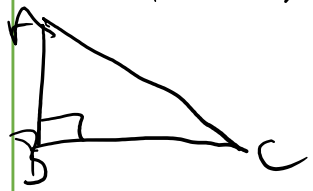
$\sec\theta = \dfrac{1}{\cos\theta}$

$\cot\theta = \dfrac{1}{\tan\theta}$

SohCahToa

Cho Sha Cao

③ Pythagoras theorem



$AC^2 = (AB)^2 + (BC)^2$

④ Sum of $\angle$s in Δ

$\hat{P} + \hat{Q} + \hat{R} = 180°$ ( )

$\hat{P} + 90° + \theta = 180°$

$\hat{P} = 90° - \theta$

Trigonometry (Definitions) - GRADE 10
Exercises - A

Exercise A

QUESTION 4

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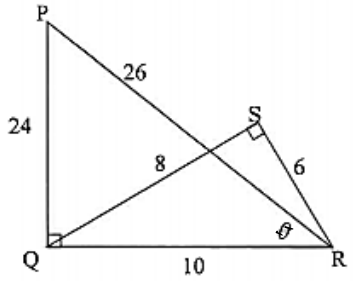

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4.2 WITHOUT using a calculator, determine the value of $\dfrac{\cot\theta}{\text{cosec}\, Q\hat{R}S}$.

Solutions

QY

4.1.1 In ΔPQR

$$\tan \hat{P} = \frac{QR}{PQ} = \frac{10}{24} = \frac{5}{12}$$

4.1.2 In ΔSQR

$$\sin S\hat{Q}R = \frac{6}{10} = \frac{3}{5}$$

4.1.4 In ΔSQR

$$\text{sec}\, S\hat{R}Q = \frac{10}{6} = \frac{5}{3}$$

Trigonometry (Definitions) - GRADE 10
Exercises - A

Exercise A

QUESTION 4

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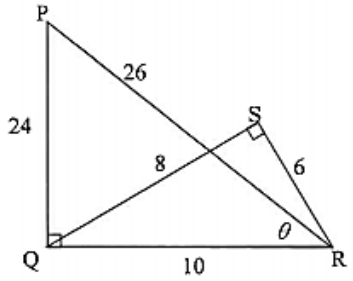

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4.1.2 $\sin S\hat{Q}R$

4.1.3 $\cos\theta$

4.1.4 $\text{sec}\, S\hat{R}Q$

4.2 WITHOUT using a calculator, determine the value of $\dfrac{\cot\theta}{\text{cosec}\, Q\hat{R}S}$.

4.1.3 In ΔPQR

$\cos\theta = \frac{10}{26} = \frac{5}{13}$

4.2 $\dfrac{\cot\theta}{\text{cosec}\, Q\hat{R}S}$

$= \frac{10}{24} \div \frac{10}{8}$

$= \frac{\cancel{10}}{24} \times \frac{8}{\cancel{10}}$

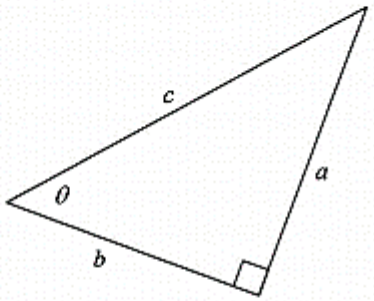
$= \frac{8}{24} = \frac{1}{3}$

Trigonometry (Definitions) - GRADE 10
Exercises - B

Exercise B

QUESTION 4

4.1 A right-angled triangle has sides a, b and c and the angle θ, as shown below.



4.1.1 Write the following in terms of a, b and c:

(a) $\cos\theta$

(b) $\tan\theta$

(c) $\sin(90°-\theta)$

4.1.2 If it is given that $a=5$ and $\theta=50°$, calculate the numerical value of b.

Solutions

4.1.1(a) $\cos\theta = \frac{b}{c}$

(b) $\tan\theta = \frac{a}{b}$

(c) $\sin(90°-\theta) = \frac{b}{c}$

4.1.2 $\tan\theta = \frac{a}{b}$

$\tan 50° = \frac{5}{b}$

$\frac{b\tan 50°}{\tan 50°} = \frac{5}{\tan 50°}$

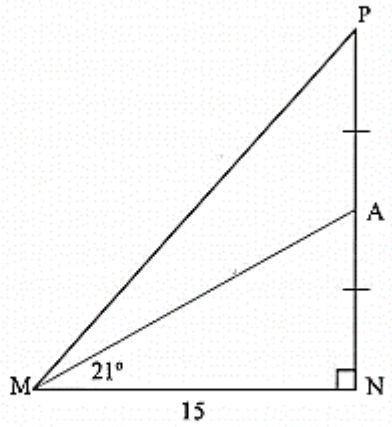
$\therefore b = 4{,}20$

Trigonometry (Definitions) - GRADE 10
Exercises - B

Exercise B

QUESTION 5

5.1 In the sketch below, ΔMNP is drawn having a right angle at N and MN = 15 units. A is the midpoint of PN and $A\hat{M}N = 21°$.



Calculate:

5.1.1 AN

5.1.2 $P\hat{M}N$

5.1.3 MP

Solutions

5.1.1 In ΔMAN

$\tan 21° = \frac{AN}{15}$

$15 \times \tan 21° = AN$

$5{,}76 \text{ units} = AN$

$\therefore AN = 5{,}76 \text{ units}$

5.1.2 $PA + AN = PN$

$\therefore PN = 11{,}52$

$\tan P\hat{M}N = \frac{11{,}52}{15}$

$P\hat{M}N = \tan^{-1}\left(\frac{11{,}52}{15}\right) = 37{,}52°$

5.1.3 In ΔMNP

$\cos 37{,}52° = \frac{15}{MP}$

$MP \times \cos 37{,}52° = 15$

$\frac{MP \times \cos 37{,}52°}{\cos 37{,}52°} = \frac{15}{\cos 37{,}52°}$

$\therefore MP = 18{,}91 \text{ units}$

OR

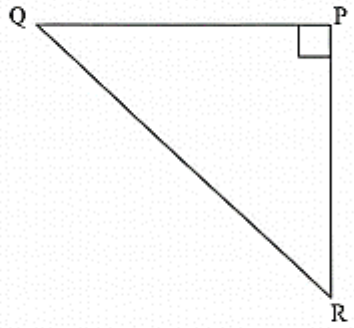
Pythagoras theorem

Trigonometry (Definitions) - GRADE 10
Exercises - C

Exercise C

QUESTION 3

3.1 In the diagram below, ΔQPR is a right-angled triangle with $Q\hat{P}R = 90°$.



3.1.1 Use the sketch to determine the ratio of $\tan(90° - R)$.

3.1.2 Write down the trigonometric ratio that is equal to $\frac{QR}{QP}$.

Solution

3.1.1 $\tan(90° - R) = \frac{PR}{QP}$

3.1.2 $\text{Cosec}\,\hat{R} = \frac{QR}{QP}$

or

$\text{Sec}\,\hat{Q} = \frac{QR}{QP}$

$\therefore \text{Cosec}\,\hat{R}$ or $\text{Sec}\,\hat{Q}$

END

$$e^{i\pi}+1=0$$

Euler's Identity

SOURCES

1. *FET CAPS DOCUMENT*
2. *GRADE 10 EXAMINATION GUIDELINES*
3. *GRADE 10 DBE/NOVEMBER 2015 -2018*