∑ DANEMATHICS
FREE CAPS MATHS RESOURCES

GRADE 10 · TRIGONOMETRY

Special Angles, Reciprocal Ratios & Trig Equations (Grade 10)

MARKING GUIDELINE

MARKS	DURATION	QUESTIONS
37	1 hour	3

Name: ..... Class: .....

Date: .....

MARK ____ / 37

INSTRUCTIONS AND INFORMATION

1. Answer **ALL** the questions in this question paper.
2. Answer QUESTION 1 by **circling** the letter (A–D) in the answer grid at the end of that section.
3. Show **ALL** calculations clearly.
4. Show all units where applicable.
5. Number the answers correctly according to the numbering system used in this question paper.
6. A non-programmable calculator may be used, unless stated otherwise.
7. Write neatly and legibly.

QUESTION 1 [10 MARKS]

Four options are given as possible answers to the following questions. Choose the correct answer and circle the letter (A–D) in the grid at the end of this section. If you want to change your choice, put a cross through the wrong letter and circle your new choice.

1.1 $\sin 30° = \ldots$ (1)

A) $\frac{\sqrt{3}}{2}$ **B)** $\frac{1}{2}$ ✓

C) $\frac{1}{\sqrt{2}}$ **D)** 1

Answer: B — In the $30°$-$60°$-$90°$ triangle the side opposite $30°$ is half the hypotenuse.

- **A** — that is $\cos 30°$
- **C** — that is $\sin 45°$
- **D** — that is $\sin 90°$

1.2 $\tan 60° = \ldots$ (1)

A) $\frac{1}{\sqrt{3}}$ **B)** $\frac{\sqrt{3}}{2}$

C) 1 **D)** $\sqrt{3}$ ✓

Answer: D — $\tan 60°$ = opposite ÷ adjacent = $\sqrt{3} \div 1$.

- **A** — that is $\tan 30°$ — the ratio is inverted
- **B** — that is $\sin 60°$
- **C** — that is $\tan 45°$

1.3 $\cos 0° = \ldots$ (1)

A) undefined

B) $\frac{1}{2}$

C) 1 ✓

D) 0

Answer: C — At $0°$ the adjacent side and the hypotenuse coincide, so their ratio is 1.

- **A** — $\cos 0°$ is perfectly well defined; it is $\tan 90°$ that is not
- **B** — that is $\cos 60°$
- **D** — that is $\sin 0°$

1.4 $\tan 90°$ is ... (1)

A) ∞

B) undefined ✓

C) 1

D) 0

Answer: B — $\tan 90°$ would need a division by an adjacent side of zero, so it has no value.

- **A** — ∞ is not a value a ratio can take — the correct word is undefined
- **C** — that is $\tan 45°$
- **D** — that is $\tan 0°$

1.5 $\sec \theta = \ldots$ (1)

A) $\frac{1}{\sin \theta}$

B) $\cos \theta$

C) $\frac{1}{\tan \theta}$

D) $\frac{1}{\cos \theta}$ ✓

Answer: D — Secant is the reciprocal of COSINE.

- **A** — that is $\operatorname{cosec} \theta$
- **B** — that is the ratio itself, not its reciprocal
- **C** — that is $\cot \theta$

1.6 $\cot 45° = \ldots$ (1)

A) 1 ✓

B) $\sqrt{3}$

C) 0

D) $\frac{1}{\sqrt{2}}$

Answer: A — $\cot 45° = 1 \div \tan 45° = 1 \div 1 = 1$.

- **B** — that is $\cot 30°$
- **C** — that is $\cot 90°$
- **D** — that is $\cos 45°$, not its cotangent

1.7 Solve for θ if $2 \sin \theta = 1$ and $0° \leq \theta \leq 90°$. (1)

A) $45°$

B) $0{,}5°$

C) 30° ✓

D) $60°$

Answer: C — $\sin \theta = 0{,}5$, and $\sin 30° = 0{,}5$.

- **A** — $\sin 45° = \frac{1}{\sqrt{2}}$, not $0{,}5$
- **B** — wrote the ratio down as though it were the angle
- **D** — that is the angle whose COSINE is $0{,}5$

1.8 Solve for θ if $\tan\theta = \sqrt{3}$ and $0° \leq \theta \leq 90°$. (1)

A) $30°$ **B)** $\sqrt{3}°$

C) $60°$ ✓ **D)** $45°$

> **Answer: C** — $\tan 60° = \sqrt{3}$.
>
> - **A** — $\tan 30° = \frac{1}{\sqrt{3}}$, the reciprocal
> - **B** — wrote the ratio down as though it were the angle
> - **D** — $\tan 45° = 1$

1.9 $\sin 60° \times \cos 30° = \ldots$ (1)

A) $\frac{3}{4}$ ✓ **B)** $\frac{\sqrt{3}}{2}$

C) $\frac{\sqrt{3}}{4}$ **D)** $\frac{1}{4}$

> **Answer: A** — Both equal $\frac{\sqrt{3}}{2}$, and $\frac{\sqrt{3}}{2}\frac{\sqrt{3}}{2} = \frac{3}{4}$.
>
> - **B** — copied one of the two values instead of multiplying them
> - **C** — multiplied out only one of the two $\sqrt{3}$ factors
> - **D** — used $\sin 30° \times \cos 60°$ instead

1.10 Solve for θ if $3\tan\theta - 3 = 0$ and $0° \leq \theta \leq 90°$. (1)

A) $1°$ **B)** $60°$

C) $30°$ **D) $45°$ ✓**

> **Answer: D** — $3\tan\theta = 3$ gives $\tan\theta = 1$, and $\tan 45° = 1$.
>
> - **A** — wrote the ratio $\tan\theta = 1$ down as though it were the angle
> - **B** — $\tan 60° = \sqrt{3}$, not 1
> - **C** — $\tan 30° = \frac{1}{\sqrt{3}}$, not 1

ANSWER GRID — MARKING GUIDELINE

1.1	A	**B**	C	D
1.2	A	B	C	**D**
1.3	A	B	**C**	D
1.4	A	**B**	C	D
1.5	A	B	C	**D**
1.6	**A**	B	C	D
1.7	A	B	**C**	D
1.8	A	B	**C**	D
1.9	**A**	B	C	D
1.10	A	B	C	**D**

QUESTION 2 [15 MARKS]

Answer the questions below WITHOUT the use of a calculator. Leave your answers in simplest surd form where necessary.

2.1 Evaluate: $\sin 30° \cdot \cos 60° + \tan 45°$ **(4)**

$= \frac{1}{2} \times \frac{1}{2} + 1$ *(2)*

$= \frac{1}{4} + 1$ *(1)* $= \mathbf{\frac{5}{4}}$ *(1)*

2.2 Evaluate: $\tan^2 60° - \sin 30°$ **(4)**

$\tan 60° = \sqrt{3}$, so $\tan^2 60° = 3$ *(2)*

$3 - \frac{1}{2}$ *(1)* $= \mathbf{\frac{5}{2}}$ *(1)*

2.3 Evaluate: $\text{cosec } 30° + \sec 60°$ **(4)**

$\text{cosec } 30° = \frac{1}{\sin 30°} = 2$ *(2)*

$\sec 60° = \frac{1}{\cos 60°} = 2$ *(1)*

$2 + 2 = \mathbf{4}$ *(1)*

2.4 Show that $\cos^2 45° + \sin^2 45° = 1$. **(3)**

$\cos 45° = \sin 45° = \frac{\sqrt{2}}{2}$ *(1)*

$\frac{2}{4} + \frac{2}{4}$ *(1)* $= \mathbf{1}$ *(1)*

QUESTION 3 [12 MARKS]

Solve for θ if $\theta \in [0° ; 90°]$. Show ALL your working.

3.1 $2 \cos \theta - 1 = 0$ **(3)**

$\cos \theta = \frac{1}{2}$ *(2)*

$\theta = \mathbf{60°}$ *(1)*

3.2 $3 \tan \theta = \sqrt{3}$ **(4)**

$\tan \theta = \frac{\sqrt{3}}{3} = \frac{1}{\sqrt{3}}$ *(2)*

$\theta = \tan^{-1}(\frac{1}{\sqrt{3}})$ *(1)* $= \mathbf{30°}$ *(1)*

3.3 $4 \sin \theta - 3 = 0$, correct to ONE decimal place **(3)**

$\sin \theta = 0{,}75$ *(1)*

$\theta = \sin^{-1}(0{,}75)$ *(1)* $= \mathbf{48{,}6°}$ *(1)*

3.4 Explain why tan $90°$ is undefined, but sin $90°$ is not. **(2)**

> $\tan\theta = \frac{\sin\theta}{\cos\theta}$ and $\cos 90° = 0$ *(1)*, so the division is impossible; $\sin 90°$ is simply 1 *(1)*

TOTAL: 37 marks

This question paper consists of 3 questions.

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