EXPRESSWALA ACADEMY

Maths 1A: Transformations

MCQ Test, Set 07

Time: 30 minutes | Maximum marks: 25

Name: _____ Class: _____ Date: _____

1. There are 25 questions. Each has exactly one correct answer: choose A, B, C or D.
2. Each correct answer carries 1 mark. There is no negative marking.
3. The key sheet and worked solutions are at the end of this test.

1. $2\cos 9\theta \sin\theta =$

A. $\sin 10\theta + \sin 8\theta$ **B.** $\sin 10\theta - \sin 8\theta$

C. $\sin 9\theta - \sin\theta$ **D.** $\cos 10\theta - \cos 8\theta$

2. $2\sin 6\theta \sin 2\theta =$

A. $\cos 4\theta + \cos 8\theta$ **B.** $\cos 4\theta - \cos 8\theta$

C. $\cos 6\theta - \cos 2\theta$ **D.** $\sin 4\theta - \sin 8\theta$

3. $2\cos 8\theta \sin\theta =$

A. $\sin 9\theta + \sin 7\theta$ **B.** $\cos 9\theta - \cos 7\theta$

C. $\sin 9\theta - \sin 7\theta$ **D.** $\sin 8\theta - \sin\theta$

4. $\sin 9\theta + \sin 3\theta =$

A. $2\sin 3\theta \cos 6\theta$ **B.** $2\sin 6\theta \cos 3\theta$

C. $2\cos 6\theta \sin 3\theta$ **D.** $-2\sin 6\theta \cos 3\theta$

5. $\cos\theta - \cos 5\theta =$

A. $\sin 3\theta \sin 2\theta$ **B.** $2\cos 3\theta \cos 2\theta$

C. $2\sin 3\theta \sin 2\theta$ **D.** $-2\sin 3\theta \sin 2\theta$

6. $\sin 3\theta - \sin\theta =$

A. $-2\cos 2\theta \sin\theta$ **B.** $2\cos\theta \sin 2\theta$

C. $2\sin 2\theta \cos\theta$ **D.** $2\cos 2\theta \sin\theta$

7. $\sin 54^\circ + \sin 6^\circ =$

A. $\cos 24^\circ$ **B.** $-\cos 24^\circ$

C. $\sin 24^\circ$ **D.** $2\cos 24^\circ$

8. The value of $\sin 75^\circ - \sin 15^\circ$ is

A. $\frac{\sqrt{2}}{4}$ **B.** $-\frac{\sqrt{2}}{2}$ **C.** $\frac{\sqrt{2}}{2}$ **D.** $\frac{\sqrt{6}}{2}$

9. $\sin 88^\circ - \sin 28^\circ + \cos 122^\circ =$

A. -1 **B.** 1 **C.** $\frac{1}{2}$ **D.** 0

10. $\frac{\cos 73^\circ + \cos 17^\circ}{\sin 73^\circ + \sin 17^\circ} =$

A. 1 **B.** 0 **C.** -1 **D.** 2

11. $\frac{\cos 34^\circ - \cos 56^\circ}{\sin 56^\circ - \sin 34^\circ} =$

A. 2 **B.** 1 **C.** -1 **D.** 0

12. $\frac{\sin 82^\circ + \sin 8^\circ}{\cos 82^\circ + \cos 8^\circ} =$

A. 2 **B.** -1 **C.** 1 **D.** 0

13. In a triangle ABC, $\sin(2A + 2B) =$

A. $-\sin 2C$ **B.** $\sin 2C$ **C.** $-\cos 2C$ **D.** $\cos 2C$

14. In a triangle ABC, $\tan \frac{C+B}{2} =$

A. $-\cot \frac{A}{2}$ **B.** $-\tan \frac{A}{2}$

C. $\tan \frac{A}{2}$ **D.** $\cot \frac{A}{2}$

15. In a triangle ABC, $\sin \frac{C+B}{2} =$

A. $\sin \frac{A}{2}$ **B.** $\cos \frac{A}{2}$

C. $-\sin \frac{A}{2}$ **D.** $-\cos \frac{A}{2}$

16. In a triangle ABC, $\cos(2B + 2A) =$

A. $\sin 2C$ **B.** $-\cos 2C$ **C.** $\cos 2C$ **D.** $-\sin 2C$

17. If $\cos x - \cos y = \frac{4}{3}$ and $\sin x - \sin y = \frac{6}{5}$, then $\cos(x + y) =$

A. $\frac{19}{181}$ **B.** $-\frac{180}{181}$ **C.** $\frac{180}{181}$ **D.** $-\frac{19}{181}$

18. If $\cos x - \cos y = \frac{2}{3}$ and $\sin x + \sin y = \frac{2}{5}$, then $\tan \frac{x-y}{2} =$

A. $-\frac{5}{3}$ **B.** $\frac{3}{5}$ **C.** $-\frac{3}{5}$ **D.** $\frac{5}{3}$

19. If $\cos x + \cos y = \frac{1}{2}$ and $\sin x - \sin y = \frac{1}{5}$, then $\sin(x - y) =$

A. $\frac{20}{29}$ **B.** $-\frac{21}{29}$ **C.** $-\frac{20}{29}$ **D.** $\frac{21}{29}$

20. If $\cos x - \cos y = \frac{3}{5}$ and $\sin x + \sin y = \frac{5}{6}$, then $\cos(x - y) =$

A. $-\frac{301}{949}$ **B.** $-\frac{900}{949}$ **C.** $\frac{301}{949}$ **D.** $\frac{900}{949}$

21. If $\cos x - \cos y = \frac{3}{7}$ and $\sin x - \sin y = \frac{1}{2}$, then $\cos(x - y) =$

A. $-\frac{111}{392}$ **B.** $\frac{307}{392}$ **C.** $-\frac{307}{392}$ **D.** $\frac{85}{392}$

22. If $\cos x + \cos y = \frac{6}{5}$ and $\sin x + \sin y = \frac{5}{6}$, then $\cos(x - y) =$

A. $\frac{1921}{1800}$ **B.** $\frac{1021}{1800}$ **C.** $-\frac{121}{1800}$ **D.** $\frac{121}{1800}$

23. If $\cos x + \cos y = \frac{1}{2}$ and $\sin x - \sin y = \frac{3}{7}$, then $\cos(x + y) =$

A. $\frac{307}{392}$ **B.** $\frac{85}{392}$ **C.** $-\frac{111}{392}$ **D.** $-\frac{307}{392}$

24. In a triangle ABC with $A = 150^\circ$ and $B = 15^\circ$, $\cos A + \cos B + \cos C =$

A. $\frac{-2\sqrt{3}+\sqrt{2}+\sqrt{6}}{4}$ **B.** $-\frac{\sqrt{3}}{2}$

C. $\frac{-\sqrt{3}+\sqrt{2}+\sqrt{6}}{2}$ **D.** $\frac{3}{2}$

25. In a triangle ABC with $A = 45^\circ$ and $B = 90^\circ$, $\cos A + \cos B + \cos C =$

A. $\sqrt{2}$ **B.** $\frac{\sqrt{2}}{2}$ **C.** 0 **D.** $\frac{3}{2}$

Key sheet

1. B	**2.** B	**3.** C	**4.** B	**5.** C
6. D	**7.** A	**8.** C	**9.** D	**10.** A
11. B	**12.** C	**13.** A	**14.** D	**15.** B
16. C	**17.** D	**18.** A	**19.** A	**20.** C
21. B	**22.** D	**23.** D	**24.** C	**25.** A

Solutions

1. $2\cos 9\theta \sin\theta =$

$2\cos A\sin B = \sin(A+B) - \sin(A-B)$ with $A = 9\theta,\ B = \theta$.

$2\cos 9\theta \sin\theta = \sin 10\theta - \sin 8\theta$

Ans: (B) $\sin 10\theta - \sin 8\theta$

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2. $2\sin 6\theta \sin 2\theta =$

$2\sin A\sin B = \cos(A-B) - \cos(A+B)$ with $A = 6\theta,\ B = 2\theta$.

$2\sin 6\theta \sin 2\theta = \cos 4\theta - \cos 8\theta$

Ans: (B) $\cos 4\theta - \cos 8\theta$

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3. $2\cos 8\theta \sin\theta =$

$2\cos A\sin B = \sin(A+B) - \sin(A-B)$ with $A = 8\theta,\ B = \theta$.

$2\cos 8\theta \sin\theta = \sin 9\theta - \sin 7\theta$

Ans: (C) $\sin 9\theta - \sin 7\theta$

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4. $\sin 9\theta + \sin 3\theta =$

$\sin C + \sin D = 2\sin\frac{C+D}{2}\cos\frac{C-D}{2}$

$\sin 9\theta + \sin 3\theta = 2\sin 6\theta\cos 3\theta$

Ans: (B) $2\sin 6\theta\cos 3\theta$

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5. $\cos\theta - \cos 5\theta =$

$\cos C - \cos D = 2\sin\frac{C+D}{2}\sin\frac{D-C}{2}$

$\cos\theta - \cos 5\theta = 2\sin 3\theta\sin 2\theta$

Ans: (C) $2\sin 3\theta\sin 2\theta$

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6. $\sin 3\theta - \sin\theta =$

$\sin C - \sin D = 2\cos\frac{C+D}{2}\sin\frac{C-D}{2}$

$\sin 3\theta - \sin\theta = 2\cos 2\theta\sin\theta$

Ans: (D) $2\cos 2\theta\sin\theta$

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7. $\sin 54^\circ + \sin 6^\circ =$

The half sum of the angles is 30°, a standard angle.

$\sin 54^\circ + \sin 6^\circ = 2\sin 30^\circ\cos 24^\circ = \cos 24^\circ$

Ans: (A) $\cos 24^\circ$

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8. The value of $\sin 75^\circ - \sin 15^\circ$ is

$\sin C - \sin D = 2\cos\frac{C+D}{2}\sin\frac{C-D}{2}$

$\sin 75^\circ - \sin 15^\circ = 2\cos 45^\circ\sin 30^\circ$

$= \frac{\sqrt{2}}{2}$

Ans: (C) $\frac{\sqrt{2}}{2}$

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9. $\sin 88^\circ - \sin 28^\circ + \cos 122^\circ =$

$\sin 88^\circ - \sin 28^\circ = 2\cos\frac{88^\circ+28^\circ}{2}\sin\frac{88^\circ-28^\circ}{2} = 2\cos 58^\circ \sin 30^\circ = \cos 58^\circ$

$\cos 122^\circ = \cos(180^\circ - 58^\circ) = -\cos 58^\circ$

$\therefore \sin 88^\circ - \sin 28^\circ + \cos 122^\circ = \cos 58^\circ - \cos 58^\circ = 0$

Ans: (D) 0

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10. $\frac{\cos 73^\circ + \cos 17^\circ}{\sin 73^\circ + \sin 17^\circ} =$

$\frac{\cos 73^\circ + \cos 17^\circ}{\sin 73^\circ + \sin 17^\circ} = \frac{2\cos 45^\circ \cos 28^\circ}{2\sin 45^\circ \cos 28^\circ}$

$= \cot 45^\circ = 1$

Ans: (A) 1

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11. $\frac{\cos 34^\circ - \cos 56^\circ}{\sin 56^\circ - \sin 34^\circ} =$

$\frac{\cos 34^\circ - \cos 56^\circ}{\sin 56^\circ - \sin 34^\circ} = \frac{2\sin 45^\circ \sin 11^\circ}{2\cos 45^\circ \sin 11^\circ}$

$= \tan 45^\circ = 1$

Ans: (B) 1

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12. $\frac{\sin 82^\circ + \sin 8^\circ}{\cos 82^\circ + \cos 8^\circ} =$

$\frac{\sin 82^\circ + \sin 8^\circ}{\cos 82^\circ + \cos 8^\circ} = \frac{2\sin 45^\circ \cos 37^\circ}{2\cos 45^\circ \cos 37^\circ}$

$= \tan 45^\circ = 1$

Ans: (C) 1

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13. In a triangle ABC, $\sin(2A + 2B) =$

In a triangle, $A + B = 180^\circ - C$.

$\sin(2A + 2B) = -\sin 2C$

Ans: (A) $-\sin 2C$

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14. In a triangle ABC, $\tan\frac{C+B}{2} =$

In a triangle, $C + B = 180^\circ - A$.

$\tan\frac{C+B}{2} = \cot\frac{A}{2}$

Ans: (D) $\cot\frac{A}{2}$

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15. In a triangle ABC, $\sin\frac{C+B}{2} =$

In a triangle, $C + B = 180^\circ - A$.

$\sin\frac{C+B}{2} = \cos\frac{A}{2}$

Ans: (B) $\cos\frac{A}{2}$

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16. In a triangle ABC, $\cos(2B + 2A) =$

In a triangle, $B + A = 180^\circ - C$.

$\cos(2B + 2A) = \cos 2C$

Ans: (C) $\cos 2C$

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17. If $\cos x - \cos y = \frac{4}{3}$ and $\sin x - \sin y = \frac{6}{5}$, then $\cos(x+y) =$

Transforming: $-2\sin\frac{x+y}{2}\sin\frac{x-y}{2} = \frac{4}{3}$ and $2\cos\frac{x+y}{2}\sin\frac{x-y}{2} = \frac{6}{5}$.

Dividing: $\tan\frac{x+y}{2} = -\frac{10}{9}$

With $t = -\frac{10}{9}$: $\sin(x+y) = \frac{2t}{1+t^2} = -\frac{180}{181},\ \cos(x+y) = \frac{1-t^2}{1+t^2} = -\frac{19}{181}$

Ans: (D) $-\frac{19}{181}$

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18. If $\cos x - \cos y = \frac{2}{3}$ and $\sin x + \sin y = \frac{2}{5}$, then $\tan\frac{x-y}{2} =$

Transforming: $-2\sin\frac{x+y}{2}\sin\frac{x-y}{2} = \frac{2}{3}$ and $2\sin\frac{x+y}{2}\cos\frac{x-y}{2} = \frac{2}{5}$.

Dividing: $\tan\frac{x-y}{2} = -\frac{5}{3}$

Ans: (A) $-\frac{5}{3}$

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19. If $\cos x + \cos y = \frac{1}{2}$ and $\sin x - \sin y = \frac{1}{5}$, then $\sin(x-y) =$

Transforming: $2\cos\frac{x+y}{2}\cos\frac{x-y}{2} = \frac{1}{2}$ and $2\cos\frac{x+y}{2}\sin\frac{x-y}{2} = \frac{1}{5}$.

Dividing: $\tan\frac{x-y}{2} = \frac{2}{5}$

With $t = \frac{2}{5}$: $\sin(x-y) = \frac{2t}{1+t^2} = \frac{20}{29},\ \cos(x-y) = \frac{1-t^2}{1+t^2} = \frac{21}{29}$

Ans: (A) $\frac{20}{29}$

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20. If $\cos x - \cos y = \frac{3}{5}$ and $\sin x + \sin y = \frac{5}{6}$, then $\cos(x-y) =$

Transforming: $-2\sin\frac{x+y}{2}\sin\frac{x-y}{2} = \frac{3}{5}$ and $2\sin\frac{x+y}{2}\cos\frac{x-y}{2} = \frac{5}{6}$.

Dividing: $\tan\frac{x-y}{2} = -\frac{18}{25}$

With $t = -\frac{18}{25}$: $\sin(x-y) = \frac{2t}{1+t^2} = -\frac{900}{949},\ \cos(x-y) = \frac{1-t^2}{1+t^2} = \frac{301}{949}$

Ans: (C) $\frac{301}{949}$

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21. If $\cos x - \cos y = \frac{3}{7}$ and $\sin x - \sin y = \frac{1}{2}$, then $\cos(x-y) =$

Square both and add, using $\cos^2 + \sin^2 = 1$:

$a^2 + b^2 = 2 - 2(\cos x\cos y + \sin x\sin y) = 2 - 2\cos(x-y)$

$\frac{9}{49} + \frac{1}{4} = 2 - 2\cos(x-y)$

$\cos(x-y) = \frac{307}{392}$

Ans: (B) $\frac{307}{392}$

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22. If $\cos x + \cos y = \frac{6}{5}$ and $\sin x + \sin y = \frac{5}{6}$, then $\cos(x-y) =$

Square both and add, using $\cos^2 + \sin^2 = 1$:

$a^2 + b^2 = 2 + 2(\cos x\cos y + \sin x\sin y) = 2 + 2\cos(x-y)$

$\frac{36}{25} + \frac{25}{36} = 2 + 2\cos(x-y)$

$\cos(x-y) = \frac{121}{1800}$

Ans: (D) $\frac{121}{1800}$

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23. If $\cos x + \cos y = \frac{1}{2}$ and $\sin x - \sin y = \frac{3}{7}$, then $\cos(x+y) =$

Square both and add, using $\cos^2 + \sin^2 = 1$:

$a^2 + b^2 = 2 + 2(\cos x\cos y - \sin x\sin y) = 2 + 2\cos(x+y)$

$\frac{1}{4} + \frac{9}{49} = 2 + 2\cos(x+y)$

$\cos(x+y) = -\frac{307}{392}$

Ans: (D) $-\frac{307}{392}$

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24. In a triangle ABC with $A = 150^\circ$ and $B = 15^\circ$, $\cos A + \cos B + \cos C =$

$C = 180^\circ - 150^\circ - 15^\circ = 15^\circ$

$\cos 150^\circ + \cos 15^\circ + \cos 15^\circ = -\frac{\sqrt{3}}{2} + \frac{\sqrt{2}+\sqrt{6}}{4} + \frac{\sqrt{2}+\sqrt{6}}{4} = \frac{-\sqrt{3}+\sqrt{2}+\sqrt{6}}{2}$

Ans: (C) $\frac{-\sqrt{3}+\sqrt{2}+\sqrt{6}}{2}$

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25. In a triangle ABC with $A = 45^\circ$ and $B = 90^\circ$, $\cos A + \cos B + \cos C =$

$C = 180^\circ - 45^\circ - 90^\circ = 45^\circ$

$\cos 45^\circ + \cos 90^\circ + \cos 45^\circ = \frac{\sqrt{2}}{2} + 0 + \frac{\sqrt{2}}{2} = \sqrt{2}$

Ans: (A) $\sqrt{2}$
