## Relationships and Calculus Assessment Standard 1.4

1. Find $\int 2 + \frac{6}{x^3}\,dx$, where $x \neq 0$.

2. Find $\int \frac{1}{x^3}\,dx$, where $x \neq 0$.

3. Find $\int \frac{3}{x^4} + 1\,dx$, where $x \neq 0$.

4. Find $\int \frac{12}{x^5}\,dx$, where $x \neq 0$.

5. (a) Find $\int \frac{\sqrt{3}}{2} \cos x\,dx$.

   (b) Integrate 3 sinx with respect to x.

   (c) Evaluate $\int_4^6 (x-3)^3\,dx$

6. (a) Find $\int \frac{1}{2} \cos x\,dx$.

   (b) Integrate sin4x with respect to x.

   (c) Evaluate $\int_2^4 (x-2)^3\,dx$

7. (a) Find $\int 2\, sinx$ dx.

(b) Integrate $\frac{1}{2}$ cosx with respect to x.

(c) Evaluate $\int_1^2 (x+3)^4$ dx

8. (a) Find $\int -3sinx$ dx.

(b) Integrate cos 4x with respect to x.

(c) Evaluate $\int_1^3 (2x+1)^3$ dx

**Relationships and Calculus Assessment Standard 1.4 Answers**

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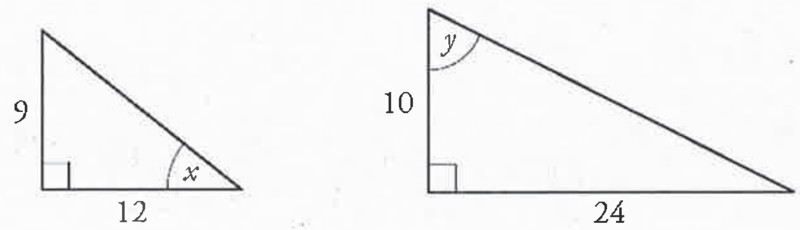
|---|---|---|---|---|
| 1. | $2x - 3x^{-2} + c$ | | | |
| 2. | $-\frac{1}{2}x^{-2} + c$ | | | |
| 3. | $-x^{-3} + x + c$ | | | |
| 4. | $-3x^{-4} + c$ | | | |
| 5. | (a) | $\frac{\sqrt{3}}{2}$ sinx + c | (b) -3 cos x + c | (c) 20 |
| 6. | (a) | $\frac{1}{2}$ sinx + c | (b) $-\frac{1}{4}$ cos 4x + c | (c) 4 |
| 7. | (a) | -2cosx + c | (b) $\frac{1}{2}$ sin x + c | (c) 420.2 |
| 8. | (a) | 3 cosx + c | (b) $\frac{1}{4}$ sin 4x + c | (c) 290 |

## Expressions and Functions Assessment Standard 1.2

1. The diagram below shows two right-angled triangles.

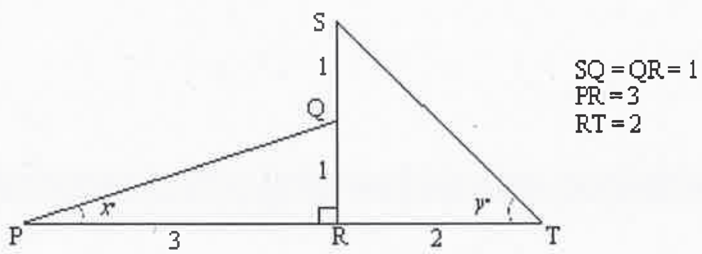



(a) Write down the values of $\sin x^{\circ}$ and $\cos y^{\circ}$.

(b) By expanding $\cos(x + y)^{\circ}$ show that the exact value of $\cos(x + y)^{\circ}$ is $\frac{-16}{65}$.

2. Express $12 \cos x^{\circ} + 5\sin x^{\circ}$ in the form $k\cos(x - a)^{\circ}$ where $k > 0$ and $0 \leq a \leq 360$.

3. The diagram below shows two right-angled triangles PQR and SRT.



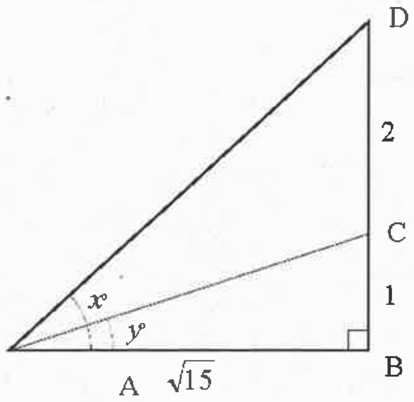

(a) Write down the values of $\cos x^{\circ}$ and $\sin y^{\circ}$.

(b) By expanding $\sin(x + y)^{\circ}$ show that the exact value of $\sin(x + y)^{\circ}$ is $\frac{8}{\sqrt{80}}$.

4. Express $2\cos x^{\circ} + 5\sin x^{\circ}$ in the form $k\cos(x - a)^{\circ}$ where $k > 0$ and $0 \leq a \leq 360$.

5. The diagram below shows two right-angled triangles ABC and ABD.

$\angle DAB = x^\circ$ and $\angle CAB = y^\circ$.



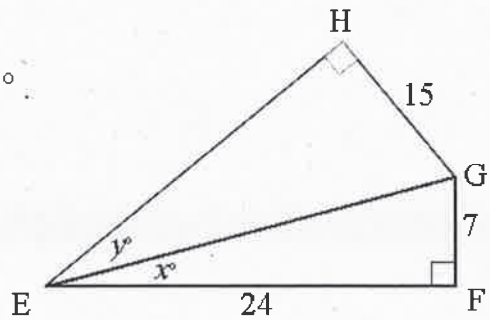

(a) Write down the values of $\cos x^\circ$ and $\sin y^\circ$.

(b) By expanding $\cos(x - y)^\circ$ show that the exact value of $\cos(x - y)^\circ$ is $\frac{18}{4\sqrt{24}}$.

6. Express $4\cos x^0 + \sin x^0$ in the form $k\cos(x - a)^0$ where $k > 0$ and $0 \leq a < 360$.

7. The diagram below shows two right-angled triangles EFG and EHG.

$\angle FEG = x^\circ$ and $\angle HEG = y^\circ$.




(a) Write down the values of $\sin x^\circ$ and $\cos y^\circ$.

(b) By expanding $\cos(x + y)^\circ$ show that the exact value of $\cos(x + y)^\circ$ is $\frac{3}{5}$.

8. Express $7\sin x^0 + 4\cos x^0$ in the form $k\cos(x - a)^0$ where $k > 0$ and $0 \leq a \leq 360$.

9. Show that $(\sin A + \cos A)^2 = 1 + \sin 2A$ and hence state the maximum value of $4(\sin A + \cos A)^2$.

10. Show that $\sin^3 x \cos x + \sin x \cos^3 x = \frac{1}{2}\sin 2x$ and hence state the minimum value of $8\sin^3 x \cos x + 8\sin x \cos^3 x$.

11. Show that $(\cos A + \sin A)(\cos A - \sin A) = \cos 2A$ and hence state the maximum value of $5(\cos A + \sin A)(\cos A - \sin A)$.

## Expressions and Functions Assessment Standard 1.2 Answers

1.(a) $\sin x = \frac{9}{15} = \frac{3}{5}$, $\cos x = \frac{10}{26} = \frac{5}{13}$ (b) Proof

2. $k = 13$, $a^{o} = 22.6^{o}$

3.(a) $\sin y = \frac{2}{\sqrt{8}}$, $\cos x = \frac{3}{\sqrt{10}}$ (b) Proof

4. $k = \sqrt{29}$, $a^{o} = 68.2^{o}$

5.(a) $\cos x = \frac{\sqrt{15}}{\sqrt{24}}$, $\sin y = \frac{1}{4}$ (b) Proof

6. $k = \sqrt{17}$, $a^{o} = 14.0^{o}$

7.(a) $\sin x = \frac{7}{25}$, $\cos y = \frac{20}{25}$ (b) Proof

8. $k = \sqrt{65}$, $a^{o} = 60.3^{o}$

9. Max value of $4(\sin A + \cos A)^2$ = max value of $4(1 + \sin 2A) = 4(1 + 1) = 8$.

10. Min value of $8\sin^3 x \cos x + 8\sin x \cos^3 x$ = min value of $8(\frac{1}{2}\sin 2x) = 8 \times (-\frac{1}{2}) = -4$.

11. Max value of $5(\cos A + \sin A)(\cos A - \sin A)$ = max value of $5 \cos 2A = 5$.