National 5 Maths
SQA 2023 Paper 2
Full Solutions

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1. 11% depreciation: $100\% - 11\% = 89\% = 0.89$

6% depreciation: $100\% - 6\% = 94\% = 0.94$

$£20\,000 \times 0.89 \times 0.94^2 \quad = \quad £15\,728.08$

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2. $300 \div (6.64 \times 10^{-24}) \quad = 4.51807\ldots \times 10^{25}$

$\approx 4.52 \times 10^{25}$

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3. Arc length $= \frac{\text{angle}}{360} \times \pi d$

$= \frac{106}{360} \times \pi \times 18.3$

≈ 16.9 m

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4. Sine rule:

$$\frac{7}{\sin 25°} = \frac{10}{\sin \text{K}}$$

$7 \sin \text{K} = 10 \sin 25°$

$\sin \text{K} = \frac{10 \sin 25°}{7}$

$\text{K} = \sin^{-1} \frac{10 \sin 25°}{7}$

$\text{K} \approx 37.1°$

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5. Each central angle in the decagon $= 360 \div 10 = 36°$

Each other angle inside the triangles $= (180 - 36) \div 2 = 72°$

Shaded angle $= 360 - 72 - 72 - 90 = 126°$

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6. $100\% + 8\% = 108\%$

108% of the original price $= £94\,500$

1% of the original price $= £94\,500 \div 108 = £875$

100% of the original price $= £875 \times 100 = £87\,500$

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7. $P = \frac{1}{3}mn - r$

$P + r = \frac{1}{3}mn$

$3(P + r) = mn$

$m = \dfrac{3(P + r)}{n}$

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8. $8^2 = 64$

$4^2 + 7^2 = 16 + 49 = 65$

$64 \neq 65$, so by the Converse of Pythagoras, the wall is not perpendicular to the ground.

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9. Volume of large pyramid $= \frac{1}{3}$ A h

$= \frac{1}{3} \times 90^2 \times (60+48)$

$= 291\,600 \text{ cm}^3$

Volume of small pyramid $= \frac{1}{3} \times 40^2 \times 48$

$= 25\,600 \text{ cm}^3$

Volume of block $= 291\,600 - 25\,600$

$= 266\,000 \text{ cm}^3$

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10. $\frac{7}{x-3} - \frac{2}{x} = \frac{7x}{x(x-3)} - \frac{2(x-3)}{x(x-3)}$

$= \frac{7x - 2(x-3)}{x(x-3)}$

$= \frac{7x - 2x + 6}{x(x-3)}$

$= \frac{5x + 6}{x(x-3)}$

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11. $150 = 20\cos x + 147$

$20\cos x = 3$

$\cos x = \frac{3}{20}$

Related acute angle = $cos^{-1}\frac{3}{20} \approx 81.4°$ (to 1 d.p.)

Solutions in 1st (A) and 4th (C) quadrants, so $x = 81.4°$ or $x = 360 - 81.4 = 278.6°$

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12. $\frac{x^2 - 16}{x^2 + x - 20} = \frac{(x-4)(x+4)}{(x-4)(x+5)}$

$= \frac{x+4}{x+5}$

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13. $2sin^2x + 2cos^2x = 2(sin^2x + cos^2x)$

$= 2 \times 1$

$= 2$

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14. (a) $45 = (x + 7)(x)(2)$

$45 = 2x(x + 7)$

$45 = 2x^2 + 14x$

$0 = 2x^2 + 14x - 45$

$2x^2 + 14x - 45 = 0$

(b) $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

$= \frac{-14 \pm \sqrt{14^2 - 4\times2\times-45}}{4}$

$= \frac{-14 \pm \sqrt{196 + 360}}{4}$

$= \frac{-14 \pm \sqrt{556}}{4}$

≈ 2.4 or -9.4 (to 1 d.p.)

Length cannot be negative, so $x = 2.4$ m

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15. Considering triangle ABC:

$\sin A° = \frac{8}{18}$

Now considering triangle ADE:

$Area = \frac{1}{2}\, a\, b \sin C$

$160 = \frac{1}{2} \times (18+6) \times \text{AE} \times \frac{8}{18}$

$160 = \frac{16}{3}\,\text{AE}$

$160 \times 3 = 16\,\text{AE}$

$480 = 16\,\text{AE}$

$\text{AE} = \frac{480}{16} = 30$ cm