National 5 Maths
SQA 2023 Paper 1
Full Solutions

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1. $2\frac{1}{6} \div \frac{8}{9} = \frac{13}{6} \times \frac{9}{8}$

$= \frac{13}{6} \times \frac{9}{8}$

$= \frac{13}{2} \times \frac{3}{8}$

$= \frac{39}{16}$

$= 2\frac{7}{16}$

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2. $(x+7)^2 + 6(x^2 - 10) = (x+7)(x+7) + 6x^2 - 60$

$= x^2 + 14x + 49 + 6x^2 - 60$

$= 7x^2 + 14x - 11$

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3. $2x + 3y = 8$ ①

$5x + 2y = -2$ ②

$4x + 6y = 16$ ① × 2 → ③

$15x + 6y = -6$ ② × 3 → ④

$11x = -22$ ④ − ③

$x = \frac{-22}{11}$

$x = -2$

Substitute into ①:

$2(-2) + 3y = 8$

$-4 + 3y = 8$

$3y = 12$

$y = 4$

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4. (a) $a = -3$

(b) $b = 2$

(c) $y = (x-3)^2 + 2$

When $x = 0$, $y = (0-3)^2 + 2$

$= (-3)^2 + 2$

$= 9 + 2$

$= 11$

So $c = 11$

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5. $a = 4,\ b = 6$ and $c = -1$

so $b^2 - 4ac = 6^2 - 4\times4\times-1$

$= 36 + 16$

$= 52$

Since $b^2 - 4ac > 0$, there are two distinct real roots.

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6. Cosine rule:

$AB^2 = 5^2 + 6^2 - 2\times5\times6\times\frac{1}{5}$

$AB^2 = 25 + 36 - 2\times6$

$AB^2 = 25 + 36 - 12$

$AB^2 = 49$

$AB = \sqrt{49}$

$AB = 7\ m$

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7. (a) Using the points $(5, 20\,000)$ and $(25, 50\,000)$:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{50\,000 - 20\,000}{25 - 5}$$

$$= \frac{30\,000}{20}$$

$$= 1500$$

Using (a, b) = $(5, 20\,000)$:

$$y - \mathrm{b} = \mathrm{m}(x - \mathrm{a})$$

$$y - 20\,000 = 1500(x - 5)$$

$$y - 20\,000 = 1500x - 7500$$

$$y = 1500x - 7500 + 20\,000$$

$$y = 1500x + 12\,500$$

$$P = 1500T + 12\,500$$

(b) When $T = 8$,

$$P = 1500 \times 8 + 12\,500$$

$$= 12\,000 + 12\,500$$

$$= 24\,500$$

The employee's salary is £24 500.

8.

$$\frac{12}{\sqrt{15}} = \frac{12}{\sqrt{15}} \times \frac{\sqrt{15}}{\sqrt{15}}$$

$$= \frac{12\sqrt{15}}{15}$$

$$= \frac{4\sqrt{15}}{5}$$

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9. (a) In ascending order, the ten ages are:

$31 \;\; 33 \;\; 35 \;\; 36 \;\; 38 \;\; : \;\; 41 \;\; 41 \;\; 42 \;\; 47 \;\; 55$

$$\text{Median} = \frac{38+41}{2}$$

$$= \frac{79}{2}$$

$$= 39.5 \text{ years}$$

$Q_1 = 35$ and $Q_3 = 42$

so $IQR = 42 - 35$

$= 7$ years

(b) On average, the readers of the newspaper are older.
The ages of the newspaper readers are more varied.

(or equivalent statements)

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10. Using x for the distance from the centre C to the midpoint of the chord AB:

$$x^2 = 50^2 - 30^2$$

$$= 2500 - 900$$

$$= 1600$$

$$x = \sqrt{1600}$$

$$= 40$$

Width $= 40 + 50 = 90$ cm

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11. $330 = 360 - 30$ so $330°$ is the angle in quadrant 4 (C) that is related to $30°$.

From the ASTC quadrant diagram, $sin\, 330^\circ < 0$.

So $sin\, 330^\circ = -sin\, 30^\circ = -0.5$

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12. $\dfrac{5c^{-2}}{c^3 \times c^4} = \dfrac{5c^{-2}}{c^7}$

$= 5c^{-9}$

$= \dfrac{5}{c^9}$

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13. (a) $a = -30$

(b) $b = 1$

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14. $\dfrac{x+1}{3} - 2 > \dfrac{3x}{5}$

$\dfrac{5(x+1)}{15} - \dfrac{30}{15} > \dfrac{9x}{15}$

$5(x+1) - 30 > 9x$

$5x + 5 - 30 > 9x$

$5x - 25 > 9x$

$5x - 9x > 25$

$-4x > 25$

$x < -\dfrac{25}{4}$