

National 5 Mathematics

2017 Exam - Paper 2

Worked Solutions

1. $|y| = \sqrt{18^2 + (-14)^2 + 3^2}$
 $|y| = \sqrt{529}$
 $|y| = 23$ 2
2. 1200×1.045^3
 $= \text{£}1369.40$
 $= \text{£}1369$ to the nearest pound 3
3. $QR^2 = PQ^2 + PR^2 - 2 \times PQ \times PR \times \cos P$
 $QR^2 = 250^2 + 180^2 - 2 \times 250 \times 180 \times \cos 147^\circ$
 $QR^2 = 170380.3511$
 $QR = \sqrt{170380.3511}$
 $QR = 412.77$ m 3
4. $x = \frac{-5 \pm \sqrt{5^2 - 4 \times 2 \times (-4)}}{2 \times 2}$
 $x = \frac{-5 \pm \sqrt{25 + 32}}{4}$
 $x = \frac{-5 \pm \sqrt{57}}{4}$
 $x = -3.137, 0.637$
 $x = -3.1, 0.6$ to 1 decimal place 3
5. $115\% = 4830$
 $1\% = 4830 \div 115 = 42$
 $100\% = 42 \times 100 = 4200$ tickets 3

6. Whole sweet

$$V = \frac{4}{3}\pi r^3$$

$$V = \frac{4}{3} \times \pi \times 12^3$$

$$V = 7238.23 \text{ mm}^3$$

Caramel

$$V = \frac{4}{3}\pi r^3$$

$$V = \frac{4}{3} \times \pi \times 9^3$$

$$V = 3053.63 \text{ mm}^3$$

Chocolate

$$V = 7238.23 - 3053.63$$

$$V = 4184.60$$

$$V = 4180 \text{ mm}^3 \text{ to 3 significant figures}$$

5

7. Larger triangle has sides 8 cm, 19 cm and 22 cm.

If the larger triangle is right-angled, $8^2 + 19^2$ must equal 22^2 .

$$8^2 + 19^2 = 425$$

$$22^2 = 484$$

As $425 \neq 484$ the larger triangle is not right-angled.

3

8a. $\overrightarrow{PR} = \underline{d} - \underline{c}$

1

8b. $\overrightarrow{TV} = \overrightarrow{TP} + \overrightarrow{PV}$

$$\overrightarrow{TV} = \underline{d} + \frac{1}{2}(\underline{d} - \underline{c})$$

$$\overrightarrow{TV} = \underline{d} + \frac{1}{2}\underline{d} - \frac{1}{2}\underline{c}$$

$$\overrightarrow{TV} = \frac{3}{2}\underline{d} - \frac{1}{2}\underline{c}$$

2

9a. $4x^2 - 25$

$$= (2x + 5)(2x - 5)$$

1

9b.
$$\frac{4x^2 - 25}{2x^2 - x - 10}$$
$$= \frac{(2x + 5)(2x - 5)}{(2x - 5)(x + 2)}$$
$$= \frac{2x + 5}{x + 2}$$

3

$$10. \quad \begin{aligned} \angle EDF &= 126 - 90 = 36^\circ \\ \angle DEF &= 270 - 230 = 40^\circ \\ \angle DFE &= 180 - 36 - 40 = 104^\circ \end{aligned}$$

$$\begin{aligned} \frac{DF}{\sin E} &= \frac{DE}{\sin F} \\ \frac{DF}{\sin 40^\circ} &= \frac{15}{\sin 104^\circ} \\ DF &= \frac{15 \sin 40^\circ}{\sin 104^\circ} \\ DF &= 9.94 \text{ km} \end{aligned}$$

4

$$11. \quad \begin{aligned} 3x - 5y - 10 &= 0 \\ 3x - 10 &= 5y \\ 5y &= 3x - 10 \\ y &= \frac{3}{5}x - 2 \end{aligned}$$

$$m = \frac{3}{5}$$

2

$$12. \quad \begin{aligned} \frac{1}{\sqrt[3]{x}} \\ &= \frac{1}{x^{\frac{1}{3}}} \\ &= x^{-\frac{1}{3}} \end{aligned}$$

2

$$13. \quad 48 \div 4 = 12$$

$$a^2 = 14^2 - 12^2$$

$$a^2 = 52$$

$$a = \sqrt{52}$$

$$a = 7.2 \text{ cm}$$

$$h = 2(7.2 + 14)$$

$$h = 42.4 \text{ cm}$$

4

14. $\frac{\text{Angle}}{360} = \frac{\text{Arc length}}{\text{Circumference}}$
 $\frac{\angle AOB}{360} = \frac{31.5}{12.8\pi}$
 $\angle AOB = \frac{31.5 \times 360}{12.8\pi}$
 $\angle AOB = 282^\circ$ 3
- 15a. $h = 40 + 23 \cos 60^\circ$
 $h = 51.5 \text{ m}$ 1
- 15b. Minimum value of $\cos x$ is -1
 \therefore Minimum value of $h = 40 + 23 \times (-1) = 17 \text{ m}$ 1
- 15c. $40 + 23 \cos x^\circ = 61$
 $23 \cos x^\circ = 61 - 40$
 $23 \cos x^\circ = 21$
 $\cos x^\circ = \frac{21}{23}$
 $x^\circ = 24^\circ, 360 - 24$
 $x^\circ = 24^\circ, 336^\circ$ 4

[END OF WORKED SOLUTIONS]



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