2022 National 5 Mathematics Paper 1

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Question 1, (2)

$$\frac{2}{3}\left(\frac{1}{5}+\frac{3}{4}\right)$$

$$=\frac{2}{3}\left(\frac{4}{20}+\frac{15}{20}\right)$$

$$=\frac{2}{3}\left(\frac{19}{20}\right)$$

$$=\frac{38}{60}$$

$$=\frac{19}{30}$$

Question 2, (2)

$$f(-3)=(-3)^3-2$$

$$=-27-2$$

$$=-29$$

Question 3, (3)

$$\text{Volume}=\frac{1}{3}\pi\, r^2\, h$$

$$=\frac{1}{3}\pi\,(10^2)\,(60)$$

$$=\frac{1}{3}\pi\,(100)\,(60)$$

$$=2000\,\pi$$

$$=2000\,x\,3.14$$

$$=6{,}280\ cm^3$$

Question 4, (3)

$ACO = 90°$

$COE = 180° - 68° = 112°$

$OCE = \frac{180° - 112°}{2} = 34°$

$ACE = 90° + 34° = 124°$

Question 5, (2) (1)

a) $x^2 + 8x + 15 = (x + 4)^2 - 4^2 + 15$

$= (x + 4)^2 - 1$

b) $(-4, -1)$

Question 6, (3)

$m = \frac{7 - (-1)}{-5 - (-3)} = \frac{8}{-2} = -4$

Using $y - b = m(x - a)$ with $(-3, -1)$ gives

$y - (-1) = -4(x - (-3))$

$y + 1 = -4(x + 3)$

$y + 1 = -4x - 12$

$y = -4x - 13$

Question 7, (2)

$D = \frac{B + 4}{C^2}$

$DC^2 = B + 4$

$B = DC^2 - 4$

Question 8, (1) (1)

a) $a = 3$

b) $b = 8$

Question 9, (2)

$$\cos B = \frac{a^2 + c^2 - b^2}{2ac}$$

$$\cos B = \frac{3^2 + 7^2 - 5^2}{2(3)(7)}$$

$$\cos B = \frac{9 + 49 - 25}{42}$$

$$\cos B = \frac{9 + 49 - 25}{42}$$

$$\cos B = \frac{33}{42}$$

Question 10, (3)

$16.10 = 70\%$

Divide both sides by 7 to give

$2.3 = 10\%$

$23 = 100\%$

So, the cost without the discount is £23.

Question 11, (3)

$(m^{-2})^4 \; x \; m^{-5}$

$= m^{-8} \; x \; m^{-5}$

$= m^{-13}$

$= \frac{1}{m^{13}}$

Question 12, (2)

$$\frac{4}{x+2} \div \frac{5}{(x+2)^2}$$

$$= \frac{4}{x+2} \; x \; \frac{(x+2)^2}{5}$$

$$= \frac{4(x+2)^2}{5(x+2)}$$

$$= \frac{4(x+2)}{5}$$

Question 13, (3)

$\sqrt{10}(\sqrt{10}-\sqrt{2})+8\sqrt{5}$

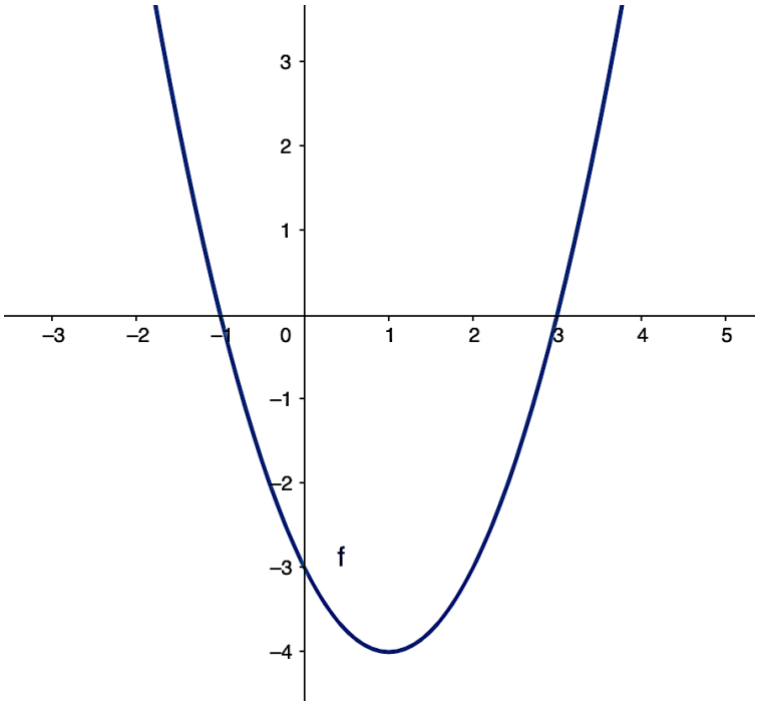
$=10-\sqrt{20}+8\sqrt{5}$

$=10-\sqrt{4}\sqrt{5}+8\sqrt{5}$

$=10-2\sqrt{5}+8\sqrt{5}$

$=10+6\sqrt{5}$

Question 14, (3)



Question 15, (1) (4)

a) Area of triangle $=\frac{1}{2}\ x\ base\ x\ height$

$=\frac{1}{2}(3)(x+12)$

$=\frac{3}{2}(x+12)$

b) Area of rectangle $=base\ x\ height$

$=(8-x)\ x\ 6$

$=6(8-x)$

Area of triangle = Area of rectangle

$$\frac{3}{2}(x+12) = 6(8-x)$$

$$\frac{3}{2}(x+12) = 48-6x$$

$$3(x+12) = 96-12x$$

$$3x+36 = 96-12x$$

$$15x = 60$$

$$x = 4$$

2022 National 5 Mathematics Paper 2

Click to jump to question:

Question 1, (3)

$(3x-2)(2x^2+5x-1)$

$= 6x^3 + 15x^2 - 3x - 4x^2 - 10x + 2$

$= 6x^3 + 11x^2 - 13x + 2$

Question 2, (3)

$215{,}000\ x\ 1.03^4 = 241{,}984.39$

So, £242,000 to the nearest thousand pounds.

Question 3, (3)

Volume of Sphere $= \frac{4}{3}\pi r^3$

$= \frac{4}{3} x\ \pi\ x\ 0.2^3$

$= 0.0335\ m^3$

Volume of Cuboid $= l\ x\ b\ x\ h$

$= 0.48\ x\ 0.48\ x\ 2$

$= 0.4608\ m^3$

Total volume of concrete needed $= 0.0335 + 0.4608 = 0.4943\ m^3$

Question 4, (1) (1) (4)

a) $4m + 3a = 4.25$

b) $5m + 2a = 4.70$

c) $4m + 3a = 4.25$ (1)

$5m + 2a = 4.70$ (2)

Multiply (1) by 2 and (2) by 3 to give

$8m + 6a = 8.5$ (3)

$15m + 6a = 14.1$ (4)

(4) – (3) gives

$7m = 5.6$

$m = 0.8$

Substitute $m = 0.8$ into (1) to give

$4(0.8) + 3a = 4.25$

$3.2 + 3a = 4.25$

$3a = 1.05$

$a = 0.35$

So, a mango costs 80p and an apple costs 35p.

Question 5, (4) (2)

a) Mean $= \frac{29 + 27 + 24 + 31 + 22 + 19 + 30}{7} = 26$

x	$x - \bar{x}$	$(x - \bar{x})^2$
29	**3**	**9**
27	**1**	**1**
24	**-2**	**4**
31	**5**	**25**
22	**-4**	**16**
19	**-5**	**25**
30	**4**	**16**
		$\sum(x - \bar{x})^2 = 96$

Standard Deviation $= \sqrt{\frac{96}{6}} = 1.6$

b) On average the hockey team did more sit-ups since their mean is higher.

The netball team's number of sit-ups was more consistent since they had a lower standard deviation.

Question 6, (2)

Area $= \frac{1}{2} gh \sin F$

$= \frac{1}{2}\ x\ 32\ x\ 25\ x \sin 58$

$= 339.2\ cm^2$

Question 7, (4)

$4x^2 + 2x - 7 = 0$

$a = 4, b = 2, c = -7$

$$x = \frac{-2 \pm \sqrt{2^2 - 4(4)(-7)}}{2(4)}$$

$$x = \frac{-2 \pm \sqrt{116}}{8}$$

$x = \frac{-2 + \sqrt{116}}{8}$ and $x = \frac{-2 - \sqrt{116}}{8}$

$x = 1.1$ and $x = -1.6$ to 2 significant figures.

Question 8, (4)

Set up a right angled triangle with long side $= 2.9\ m$ and short side $= 2\ m$.

By Pythagoras we have

$a^2 + 2^2 = 2.9^2$

$a^2 + 4 = 8.41$

$a^2 = 4.41$

$a = \sqrt{4.41} = 2.1$

Height $= 2.1 + radius$

$= 2.1 + 2.9 = 5m$

Question 9, (3)

$3 \sin x + 4 = 6$

$3 \sin x = 2$

$\sin x = \frac{2}{3}$

$sin^{-1}\left(\frac{2}{3}\right) = 41.8°$

From CAST $x = 41.8°$ and $x = 180° - 41.8° = 138.2°$

Question 10, (3)

Arc Length $= \frac{angle}{360}\ x\ \pi d$

Let the angle be a

$69.4 = \frac{a}{360}\ x\ \pi\ x\ 30$

$69.4 = \frac{30\pi a}{360}$

Rearranging gives

$a = \frac{69.4\ x\ 360}{30\pi}$

$a = 265°$

Question 11, (3)

Set up a right angled triangle on the base of the cuboid, EGH.

This triangle has short sides 24 cm and 6 cm. Let the long side be c.

Using Pythagoras gives

$24^2 + 6^2 = c^2$

$576 + 36 = c^2$

$c^2 = 612$

$c = 24.7\ cm$

Set up a second right angled triangle which includes the diagonal, ECG.

This triangle has short sides 24.7 cm and 8 cm. Let the long side be c.

Using Pythagoras gives

$24.7^2 + 8^2 = c^2$

$610.1 + 64 = c^2$

$c^2 = 674.1$

$c = 26\ cm$

Question 12, (3)

$$\frac{2ab + 6a}{b^2 - 9}$$

$$= \frac{2a(b + 3)}{(b + 3)(b - 3)}$$

$$= \frac{2a}{(b - 3)}$$

Question 13, (2)

$$\frac{\sin x + 2\cos x}{\cos x}$$

$$= \frac{\sin x}{\cos x} + \frac{2\cos x}{\cos x}$$

$$= \tan x + 2$$

Question 14, (5)

Start by making all of the angles in the triangle ACD.

Angle at $C = 180 - 28 = 152°$

Angle at $A = 180 - (152 + 12) = 16°$

Using the Sine Rule on triangle ACD gives

$$\frac{a}{\sin A} = \frac{d}{\sin D}$$

$$\frac{15}{\sin 16} = \frac{d}{\sin 12}$$

$$d = \frac{15 \sin 12}{\sin 16} = 11.3\ m$$

Next, make all of the angles in the triangle ABC.

Angle at $A = 180 - (90 + 28) = 62°$

Using the Sine Rule on triangle ABC gives

$$\frac{a}{\sin A} = \frac{b}{\sin B}$$

$$\frac{a}{\sin 62} = \frac{11.3}{\sin 90}$$

$$a = \frac{11.3 \sin 62}{\sin 90}$$

$$a = 9.98\ m$$